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IN MEMORIAM

George Braxton Pegram (1876-1958)

In its one hundred and forty years The New York Academy of Sciences can count among its illustrious members none who has done it more honor than George Braxton Pegram, who had been included in one or another of the various classes of membership since November 1916. He had been elected a Fellow in 1917, and was a Life Member from November 1957 until his death on August 12, 1958. Pegram had served in various official capacities: As vice-president and chairman, Section of Astronomy, Physics, and Chemistry, 1918; as councilor, 1917 to 1919; as recording secretary, 1947 to 1948; as vice-president, 1949 to 1950; and as president, 1952.

It is perhaps never possible to account entirely for a man's career and accomplishments by the recognizable factors in his origin and youth, but in the case of Pegram great things were already foreshadowed by his genesis and early environment. Taken together, the lives of the father, William Howell Pegram, 1846 to 1928 and the son, George Braxton, 1876 to 1958, span a period of 100 years that will undoubtedly take its place as one of the greatest eras in history – one of great fundamental scientific discoveries and technical triumphs, of explosive growth in human population, of two great world wars and, in the case of both men, the blossoming of two great universities.

Let us look briefly at the early origins. In a little country village in North Carolina about 1838 there was founded an old-fashioned academy that passed through various stages and names to the status of a normal school. It was chartered in 1859 as Trinity College, from which the village took its name of Trinity, and here, on October 24, 1876, George Pegram was born. Braxton Craven became president of the college in 1842 and held that position until he died in 1883. George's father was professor of chemistry and, when Craven died he became acting president. Pegram the elder married Braxton Craven's daughter, Emma Lenore, who bore a son whom they named George Braxton for his grandfather. In 1891 Washington Duke, first of the great tobacco industrialists, gave $85,000 to finance the removal of the little college to Durham in 1892 and in 1896 he donated another $100,000. Here Pegram the younger received his Bachelor's Degree in 1895. He spent the next four years as high school teacher in the North Carolina public schools. Pegram the elder continued as professor of chemistry and lived to see, after several increasing benefactions, the great Duke fortune endow what became Duke University in 1924. Pegram the elder died in 1928 at the age of 82. It is an interesting fact that Pegram the younger died also at the age

of 82, the lives of father and son overlapping by 52 years. While Pegram the younger was teaching high school, the great discoveries of radium and radioactivity were being made in Europe. The Curies, Pierre, Marja, and Iréne, and G. Bémont discovered radium in 1898. In 1899 George borrowed $450 from a friend and entered Columbia University as candidate for his doctorate. As further evidence of his common interests and influence on his son, in 1911 Pegram the elder presented to the North Carolina Academy of Science a paper on "The Problem of the Constitution of Matter" that shows remarkable insight only a few years after the earliest epoch-making discoveries of radium and radioactive phenomena.

It is therefore evident that Pegram the younger had the advantages from childhood of a fine genetic stock, as well as of a scholarly and academic family and environment. The momentum begun in youth was sustained throughout George's life – the father progressing from a village institute to Duke University, and the son through the growth of Columbia University and the dramatic events in atomic and nuclear science and World War II.

While George Pegram was still a graduate student at Columbia he became assistant in physics in 1900 and achieved his doctorate in 1903 with the thesis "Secondary Radio Activity in the Electrolysis of Thorium Solutions." He was a tutor in physics, 1903 to 1905; an instructor, 1905 to 1907; and, as a Tyndall Fellow, 1907 to 1908, he studied at the university of Berlin and at Cambridge. At the former he had as fellow students Max Planck and Lise Meitner; Otto Hahn was conducting research there at the same time amid the ferment caused by Albert Einstein's recently announced relativity theory.

In 1909, on his return to Columbia, he was appointed assistant professor of physics; in 1912, associate professor; and, in 1918, full professor. Meanwhile his administrative talents had been recognized. In 1917 he was acting dean, and from 1918 to 1930 was dean of the School of Mines, Engineering, and Chemistry. The years from 1930 to 1936 he devoted to teaching and to research on, among other things, measurements of the neutron. In 1937, with John R. Dunning, he transmuted aluminum to silicon and rhodium to palladium.

However, in 1936 he was recalled to administration; the trustees designated him dean of the graduate faculties. In this capacity he administered the affairs of Columbia's great and growing graduate school and set the stage for its role in the great effort of World War II. He was chairman of the Columbia University Committee on War Research, 1940 to 1945, and chairman of the Columbia University Committee on Government Aid Research from 1945 to 1950 and again from 1950 to 1955.

In 1950 he was vice-president of the university under General Dwight D. Eisenhower, sharing with Provost Albert C. Jacobs the direction of Columbia's educational and research program.

The greatest events of George Pegram's life were those associated with atomic physics and World War II. Early in 1939 he arranged to have Enrico Fermi come to this country; almost immediately thereafter, on January 25, Fermi and Dunning confirmed the conversion of mass into energy in the cyclotron, a demonstration that Otto Hahn had performed earlier in Germany. Six days later Pegram announced this epochal event and, in March, he brought the matter to the attention of the United States Navy because it seemed to him to offer a solution to the persistent problem of fuel for submarines. After Einstein had written a letter to President Franklin D. Roosevelt a year later pointing out the potentialities of atomic energy for war purposes, the president appointed an Advisory Committee on Uranium to keep him informed of developments. Pegram was chairman of this committee and Harold C. Urey was a member. This committee was expanded and served throughout the war as the major advisory group to the Manhattan Engineering Project and the atomic bomb program.

In October 1941 Pegram and Urey, returning shortly after the disaster at Pearl Harbor, Hawaii, from a government mission to England to discuss nuclear development with British scientists, submitted reports that made it clear that the United States must assume chief responsibility for the development of the atomic bomb. As a result, the government decided that greater effort should be directed to developing the diffusion method of separating U-235 and to accomplishing a chain reaction in a U-graphite pile on which progress had already been made by Fermi, Herbert L. Anderson, Walter H. Zinn, George Weil, Bernard T. Feld, and others at Columbia. Pegram's distinguished staff included also Urey, I. I. Rabi, and Dunning. The graphite pile chain reaction project was later transferred to Chicago.

In 1941 a group of scientists organized under Pegram's leadership carried out a wartime secret project involving the magnetic airborne detector, which was of great value in detecting enemy submarines. In 1946 Pegram was elected to the Board of Trustees of Associated Universities, Inc., formed by nine eastern universities, including Columbia, to administer the Brookhaven National Laboratory for Nuclear Research, Brookhaven, N. Y. From 1946 to 1950 he was a member of the Board of Trustees of the Oak Ridge Institute of Nuclear Studies at Oak Ridge, Tenn., and served as its consultant from 1950 to 1955.

Pegram, of course, contributed many papers to scientific literature. He was the recipient of numerous honorary degrees and many other honors, and a member of numerous learned societies, among them The National Academy of Sciences; The American Physical Society, of which he was treasurer from 1918 to 1957 and president in 1941; Sigma XI, treasurer from 1917 to 1949, and president, 1925; and Fellow of the American Association for the Advancement of Science.

The names of the members of this distinguished family are fittingly enshrined on the campuses of two great universities: that of the grandfather in the Craven Building, that of the father in the Pegram Building at Duke University, and that of the son in the George Braxton Pegram Physics Laboratory at Columbia University.

George Braxton Pegram is survived by his wife, Florence Bement Pegram, and two sons, William Braxton and John Bement Pegram.

Prepared by
Harden F. Taylor
December 1958

SECTION OF GEOLOGY AND MINERALOGY

AMERICAN CORAL SEAS*

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Long isolation of the tropical Atlantic region, or West Indian biogeographical province, has led to marked evolutionary divergence and decline of the reef corals there, by contrast with those of the Indopacific region. The West Indian reefs from the Brazilian coast to Bermuda also differ from a majority of Old World coral reefs in form, retarded growth, and inability to withstand exposure to great waves of the open sea.

The best developed reefs of the West Indian province usually show 3 principal biotic zones controlled by the conditions of turbulence and light at different depths. These are: (1) an outer belt of massive corals, especially *Montastrea annularis*, lying at substrate depths between about 60 and 30 feet; (2) an intermediate belt of elkhorn corals, *Acropora palmata*, in turbulent waters between about 30 and 6 feet; and (3) an inner rocky shoal rising to the lowest tide level and characterized by *Millepora alcicornis*, coralline algae, gorgonians, and scattered small massive corals.

Living West Indian reefs rarely are marginal with respect to deep waters. Instead, they are inset a few hundred yards from the extreme edge of a platform that evidently was eroded during times of Pleistocene low sea levels. Almost all of the reefs are restricted to the windward sides of platforms, and very few reach low-tide levels. They rarely mask the character of the submerged terraces and drowned beach ridges on which many of them rest. Consequently they present an aspect of immaturity.

The gently descending bottom at depths below about 50 or 60 feet in front of the reefs is nearly level. Although it is usually marked by scattered massive coral heads, there are few reef knolls and these generally are low and insignificant. Since almost all of the reefs rise from comparatively level platforms less than 60 feet deep, it seems that there has been little drowning or stimulation of vertical growth by subsidence or rising sea level during the life of the reefs. Evidently, they were established recently on an antecedent platform when rising sea level and water temperatures had nearly reached the present values. They probably are not more than 3000 to 6000 years old.

Coralline algae play a minor role in the West Indian province, and the absence of a protective algal ridge at the reef front in the surf zone prevents the development of a solid platform at low tide level comparable

*This paper was presented at a meeting of the Section on November 3, 1958.

to the reef flat of Indopacific reefs. In the West Indian province, wherever coral reefs are lacking, the bottom is being deepened by mechanical erosion to depths of about 4 or 5 fathoms, and it is evident that intertidal erosion is not the chief process of marine planation here.

During much of the Quaternary period the tropical western Atlantic, unlike much of the western Pacific and Indian Oceans, was too cool to support flourishing reefs, and existing reefs did not become established until very recently. Extreme youth and temperatures still below the optimum in many areas may explain characteristic low growth rates and the immaturity of the West Indian reefs.

Living West Indian reefs form only a thin veneer over submerged terraces of nonreef rocks. There are indications, however, that coral reefs formerly were more extensive, perhaps equaling in grandeur present reefs of the western Pacific. Fossil evidence shows that West Indian reef corals were more varied than now in the early Tertiary, and that the climate before the Miocene was considerably warmer and more favorable for reef growth.

Extending from the latitude of Savannah, Ga. about 900 miles southeastward to Hispaniola, the continental shelf of North America, composed mainly of calcareous deposits, is bounded by a precipitous escarpment that rises 12,000 to 15,000 feet above the adjacent floor of the deep ocean. In the area of the Bahama Islands the shelf is flat and generally less than 10 fathoms deep. It is interrupted here and there by deep canyon-like trenches that divide the shelf into numerous platforms similar to oceanic atolls. If the Atlantic waters were removed, the shelf here would be counted as one of the most impressive physiographic features in the world. It is the more remarkable because the record of a deep petroleum test in the Bahamas and many deep-sea cores and geophysical soundings taken by scientists of the Lamont Geological Observatory, Palisades, N. Y., indicate that much of the southeastern shelf of North America has been built up of beds of limestone that have been accumulating since the Jurassic period. Early reef growth may have begun along a volcanic arc near the present edge of the shelf.

The shelf edge resembles the Great Barrier reef of Australia in dimensions, form, and relief, and the isolated banks of the Bahamas are similar to certain Pacific atolls, except that the outer margin is now too deep for living coral reefs. The most probable explanation of the steepness of the marginal escarpment, which locally exceeds the angle of repose of unconsolidated sediments, is that it is formed of drowned coral reefs that for a long time maintained a position near sea level during subsidence, in the manner suggested by Charles R. Darwin for Indopacific reefs. Reef growth and accumulation of calcareous sediments terminated first in the north on the Blake plateau that is now drowned under more than half a mile of water. This may have resulted from increasing coolness of the surface waters since the Miocene epoch.

Upbuilding of the Bahamian and Floridian reefs continued, however, until they were killed by the onset of the glacial climate of the Pleistocene epoch, and reef communities have been re-established only recently with the gradual warming of post-Pleistocene climate.

SECTION OF BIOLOGY

GENERAL MATHEMATICAL PRINCIPLES IN BIOLOGY*

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Although scattered attempts to apply mathematical methods to biology date back almost a century, the systematic development of mathematical biology as an independent science is only about three decades old. In those three decades, however, mathematical biology has developed very rapidly and has to its credit an impressive array of achievements. For the older works we must refer to the now classic books by Alfred J. Lotka[1] and Vito Volterra,[2] both of which deal with interactions of species. The advances since about 1930 are presented in my *Mathematical Biophysics, Physicomathematical Foundation of Biology.*[3,4]

A very large number of phenomena has been treated mathematically. These phenomena range from cell division, cell respiration, certain features of early embryological developments, electric phenomena in cells, permeability and active transport, circulation of blood, exchange of metabolites between blood and tissues, excitation and conduction in peripheral nerves, central excitation and inhibition, reaction times, psychophysical judgment, discrimination of intensities, vision, perception of *Gestalts*, conditioning, learning, reasoning, and problem solving. Many others are not listed above. In several cases the development of a mathematical theory of a phenomenon led, not only to a good quantitative agreement between theory and available experimental data, but to the prediction of new quantitative relations that subsequently were found experimentally to agree with the predicted ones.

In spite of this progress, one important feature was lacking until recently in these developments. They were based on the construction of physicomathematical or completely formal mathematical models. A certain set of assumptions was made, and it was shown that from those assumptions definite conclusions can be drawn.

Such a procedure is not alien to physics. The kinetic theory of gases is basically a mechanical "model" of a gas. We also have had in physics a succession of models of such concepts as the atom. In physics, however, those models are based on some general principles. As examples of such general principles we may name the laws of Newton, the principles of thermodynamics, and the principle of relativity.

If we ask whether any general biological principles have been formulated mathematically in the above-mentioned studies, the answer is

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an emphatic "No." I attempted to remedy the situation in 1944 in connection with the theory of organic form.[5] A brief summary was given in a paper included in the monograph *Dynamic Anthropometry* published in 1955.[6] In its first formulation the theory, then called the "principle of maximum simplicity," stated that the structure of an organism is the simplest possible one compatible with the performances of a prescribed set of biological functions. However, the concept of simplicity is a rather vague one. Subsequently, therefore, in connection with David Cohn's work on the theory of the structure of the capillary bed,[7a,b] the designation "principle of optimal design" was introduced. It is formulated thus:[4] "For a prescribed set of biological functions of given intensities, such as rate of metabolism, velocity of locomotion, etc., the design of an organism is such as to be optimal with respect to economy of material and energy expenditure."

While this formulation is by no means perfect, the principle leads to a number of quantitative conclusions that enable us to calculate the sizes of different parts of an organism and to determine approximately the gross shape of some organisms. The conclusions are verified by available observation.[4,6]

In 1954 I proposed another general mathematical principle of a very different nature.[8] This principle emphasizes the unity of the organism as a whole and the unity of the organic world as a whole. Furthermore, it brings into focus the important "relational" aspects of biology, as distinct from the quantitative or "metric" aspects, which have been emphasized hitherto. We shall discuss that principle in this paper.

Relational similarities between different organisms are well known. Thus a paramecium, under the action of an appropriate stimulus, will move after food, will contact and ingest it, excrete the indigestible residue, and absorb and assimilate the remainder. Alternatively, the paramecium may move toward another paramecium, with which it will conjugate, thus performing an elementary sexual act. A bird, stimulated by the sight of an insect, will fly toward the insect, catch, eat, and digest it, defecate the indigestible residue, and absorb and assimilate the remainder. It, too, may fly after a mate and perform a sexual act.

In man a much more complex system of stimuli may make him perform a highly complex set of motions, which directly or, more probably indirectly, lead to his obtaining food. That food is similarly ingested and digested. To the extent that we may consider our thoughts as covert movements, we may say that an engineer's or a scientist's thinking, through which he earns his living, comprises a complex set of covert motions that lead him to his food; the composition of a love sonnet by a poet, which may indirectly result in his finding a mate, again bears a relational similarity to the locomotions of a paramecium or of a bird that lead them to their respective mates.

The physical mechanisms of sensation in a paramecium, in a bird, and in a man are all quite different, as are their quantitative aspects. The mechanism of locomotion of a paramecium, that of the flight of a bird, and that of the thought of a scientist are perhaps even more different. The same may be said about the mechanisms of digestion, excretion, assimilation, and the sexual act. However, the relations between the corresponding biological properties remain the same in all cases.

Moreover, in higher animals a very complex mechanism of sensations of different types corresponds to the relatively simple sensation of the paramecium. We have visual, auditory, olfactory, and other sensations. Logically, they are all included in the general concept of sensation. They may all be called subproperties of the general property of sensation. Thus, to a larger number of subproperties of some biological property in a higher organism, there corresponds a smaller number of subproperties in a lower one. However, once this correspondence is noticed, the relations between such basic biological properties as sensation, locomotion, ingestion, and digestion are found to be the same in all organisms.

An organism is recognized as such because it possesses a set of biological properties such as those mentioned above. Consequently, we may say that operationally an organism may be defined as a set of biological properties. These facts, which are so well known as occasionally to be overlooked, may then be stated in mathematical terms by saying that the sets of biological properties that characterize a given organism can be brought into correspondence with respective sets of biological properties of another organism in such a manner that certain basic relations are preserved. Moreover, as we have said, the number of subproperties of any biological property in a higher organism is greater than in a lower one. Therefore, it follows that several subproperties of the same biological property in a higher organism correspond to one subproperty of a given property in a lower organism.

Putting all these statements into somewhat more mathematical language, we may say that the set of all subproperties that characterize a given higher organism can be mapped in a many-to-one manner onto the set of all subproperties that characterize a lower organism and that, in this mapping, certain basic relations between the different properties are preserved. This is a very general formulation of the proposed new principle.

In mathematics a set is defined as a collection of objects. These may be physical objects, such as chairs or tables, or conceptual objects, such as numbers. We may speak of the set of chairs in a room, or of the set of integers between 0 and 10. The objects that form a set are called its elements. If all elements of a set are also elements of another set, then we may say that the first set is included in the other or that

the first set is a subset of the other. Thus, the set of integers 1, 2, 5 is a subset of the set of integers 1, 2, 3, 4, 5, 6.

A biological property, as we have seen, includes a number of subproperties. Each of these may include "finer" subproperties. For instance, the subproperty "sensitivity to light" includes "sensitivity to green," and "sensitivity to yellow." Thus, every biological property may be considered as part of a set, the subproperties as different subsets.

Consider the property of orderly movements (as opposed to disorderly thermal agitation). This is a set that has two important subsets. One is the subset of molar movements, P_{M1}, which involve the displacement of the whole organism in space or the relative displacements of different parts of the organism. The other is the subset P_{M2} of orderly molecular movements, such as the diffusion flow of some metabolite into the cell or from the cell. In nonmotile organisms such as some bacteria, the subset P_{M1} is absent, but P_{M2} is present. The subset P_{M1} contains as its subsets such types of movements as those of skeletal muscles, of the gastrointestinal tract, and of the heart.

We have already mentioned that such properties of a higher organism as sensitivity to light and to sound correspond to, or map on, the general sensitivity of some lower organism. Similarly, the different types of movements of a higher organism map on the more inclusive type of movements of a lower one.

We now introduce the concept of a "primordial organism." We consider this possibly as an abstraction, defined as an organism, which consists of the set of most general and most inclusive properties. If such a "primordial" organism exists, it is probably found on the molecular level, but it may not actually exist.

The principle of mapping already described leads to the following: The sets of biological properties that characterize any organism can be mapped on the set of biological properties of the primordial organism in such a manner that certain basic relations between the biological properties are preserved. Moreover, those properties of an organism that are subsets of a given property map on that given property of the primordial.

The basic relations preserved in such mapping are essentially relations of "immediate precedence" and "immediate succession." Thus, in our example of the paramecium, the sensitivity to a stimulus immediately precedes the locomotion that precedes contact with food and other activities.

If we know the set of properties of the primordial, we are therefore led to the following method of constructing all possible sets of subproperties that represent different organisms.

For all biological properties P_i of the primordial, we select any number of subproperties $P_{i\alpha}$. Then, if P_i immediately precedes P_k we require that every $P_{i\alpha}$ should immediately precede at least one $P_{k\beta}$. All possible

combinations of $P_{i\alpha}$'s and $P_{k\beta}$'s represent all possible organisms. If P_i does not immediately precede P_k, then no $P_{i\alpha}$ immediately precedes any $P_{k\beta}$.

Instead of the relation of immediate precedence we may consider any binary relation between P_i and P_k. More generally, we may consider also n-ary relations. For details we must refer the reader elsewhere[10].

We thus give a more precise mathematical formulation to the principle already proposed in this paper. In this construction not only do subproperties of an organism map on the corresponding properties of a primordial, but it can be shown[9] that they can be mapped on the subproperties of other organisms, and the basic relations of immediate precedence and immediate succession are preserved in this mapping.

An additional requirement, however, must be added to the above construction. In a set of subproperties constructed in the above manner it may happen[9] that the whole organism can be divided into several parts that do not stand in any relation to each other. This is a biological absurdity. To obviate this it can be shown[9] that we must add the following requirement to the construction.

At least for one i a $P_{i\alpha}$ must immediately precede at least two $P_{k\beta}$'s, if P_i precedes P_k in the primordial. Limitations of space do not permit us to go into the detailed mathematical argument that leads to this postulate.

A number of interesting conclusions can be drawn from all the above. Here we shall derive only one, and merely enumerate a number of others. For the proof of those other conclusions the reader is referred to an earlier paper, in which, however, a different approach is used.[9]

We know that in some organisms a sensation of some stimulus is followed by movement. Hence, if P_S denotes the property of sensation in the primordial and P_{M1} the property of movement, P_{M1} must succeed P_S in the primordial. Hence, in some higher organisms some subproperties of P_{M1} must immediately succeed some subproperties of P_S. A particular subproperty of P_{M1} is the motility of the gastrointestinal tract. Hence, among all possible combinations previously mentioned, there will be some in which gastrointestinal motility follows a set of sensations of different kinds. To the extent that our psychological experiences are manifestations of a complex interplay of sensory activities, we may infer that in some higher animals psychological disturbances will produce gastrointestinal disturbances. This is a well-known fact, especially in man. It must be emphasized that there would seem to be no difficulty whatsoever in constructing a neurobiophysical model that would explain the mechanism of the effect of emotions on gastrointestinal activities. However, in order to need such a model, we must already know that the fact exists; we take it as given. Here, however, we derive the existence of a fact from a general biomathematical principle.

All conclusions derived from the principle of mapping are of the form: in some organisms a particular phenomenon exists; or, there are some organisms in which such a phenomenon exists. The principle, at least in its present form, does not tell in which organisms to expect the phenomenon; nevertheless, it gives a powerful stimulus for further experimental search.

We now mention some other conclusions:

In some organisms emotional disturbances affect the cardiovascular system. This is a well-known fact.

In some organisms sensory stimulation and/or emotional experiences affect secretions of various glands. This is also well known.

There exist organisms that secrete substances by special glands in order to catch food. The spider web is an example.

Some unicellular organisms produce substances harmful to other unicellular organisms (bacterial antagonisms and antibodies).

Some unicellular organisms produce antibodies when they are stimulated by appropriate antigens. An inconclusive search for such effects has been reported.[10]

Some plants produce antibodies. It is accepted that plants in general do not produce antibodies,[11] although some evidence of such a production has been submitted.[12] The fact that only a few plants have been investigated in this respect justifies a continued search.

Those are only a few conclusions. For others we refer the reader elsewhere.[9]

References

1. LOTKA, A. J. 1925. Elements of Physical Biology. Williams & Wilkins. Baltimore, Md. Reprinted by Dover Publications, Inc. New York, N. Y. in 1954 under the title Elements of Mathematical Biology.
2. VOLTERRA, V. 1931. Leçons sur la theorie mathematique de la lutte pour la vie. Gauthiers-Villars. Paris, France.
3. RASHEVSKY, N. 1958-1959. Mathematical Biophysics. Physicomathematical Foundations of Biology. 3rd ed. I. Dover Publications, Inc. New York, N. Y.
4. RASHEVSKY, N. 1959. Mathematical Biophysics. Physicomathematical Foundations of Biology. 3rd ed. II. Dover Publications, Inc. New York, N. Y.
5. RASHEVSKY, N. 1944. Studies in the physicomathematical theory of organic form. Bull. Math. Biophys. **6**: 1-59.
6. RASHEVSKY, N. 1955. Organic form as determined by function. Ann. N. Y. Acad. Sci. **63**(4): 442-52.

7a. COHN, D. L. 1954. Optimal systems: I. The vascular system. Bull. Math. Biophys. **16**: 59-74.

7b. *Ibid.* **17**: 219-27.

8. RASHEVSKY, N. 1954. Topology and life; in search of general mathematical principles in biology and sociology. Bull. Math. Biophys. **16**: 317-48.
9. RASHEVSKY, N. 1958. A contribution to the search of general mathematical principles in biology. Bull. Math. Biophys. **20**: 71-93.
10. RASHEVSKY, N. 1959. A set-theoretical approach to biology. Bull. Math. Biophys. (March) **20**.

11. FOX, S. W. & E. PLAISTED. 1953. The precipitability of two modified proteins. Proc. Soc. Exptl. Biol. Med. 84: 392-94.

12. CUSHING, J. E. & D. M. CAMPBELL. 1957. Principles of Immunology. McGraw-Hill. New York, N. Y.

13. WALLACE, J. M. 1950. Immunological properties of plant viruses. *In* Viruses, :93-98. M. Delbruch, Ed. Calif. Inst. Technol. Pasadena, Calif.

SECTION OF MATHEMATICS AND ENGINEERING

THE CORRELATION OF FOUR-BAR STRAIGHT-LINE MOTION DEVICES BY MEANS OF THE ROBERTS THEOREM AND A DIRECT PROOF OF THE LATTER*

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Abstract

This paper deals with all the known straight-line mechanisms of four bars showing their variants in numerous figures. Next it considers a new and simple direct proof of the Roberts Theorem and shows that the general assumption of two mechanisms existing which describe the same coupler curve when one hinge is replaced by a sliding pair holds true only for the "outer" or fixed hinges, but not for the inner or moving hinges, in which case there exists only one mechanism. This was not known previously.

Finally, this paper demonstrates the application of the Roberts Theorem to the correlation of the four-bar straight-line mechanisms described and depicted in the first part. It also shows that the real reason for the results of the correlation lies in the position of the various mechanisms in the curvature system.

*This paper, illustrated with slides and models, was presented at a meeting of the Section on November 21, 1958. It will be offered for publication in the *Annals of The New York Academy of Sciences*.

SECTION OF ANTHROPOLOGY

FAMILY STRUCTURE AND SOCIAL MOBILITY*

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This paper will report certain aspects of research on a Kentucky county. Border county, divided sharply into two differing geographical areas, provides an excellent laboratory for the examination of subcultural variation. The original research (Birdwhistell, 1951) was concerned with demonstrating the relationship between the patterns of socialization in these areas and the differences in the mobility potential of the inhabitants. In this paper the differences between the family structures of the two groups will be examined in an attempt to isolate certain of the influences at play in developing character types with a tendency to migrate or be mobile in contrast to those that seem to be relatively stationary and socially immobile.

The relatively late discovery, exploration, and settlement of this continent has given American history a particular bent. Any description of life in the United States must recognize the extent to which migration and mobility have been dominant patterns in its development. From the earliest colonies came successive waves of settlers who crossed the mountains, established themselves in the near western lands, and sent their sons and daughters to repeat the process until the continent was filled. Every school child learns of the country in these terms, and the national literature, myth, and ballad are enriched by the recurring theme of this pioneering saga.

The movement of inhabitants of the United States has not been purely spatial migration. No less important have been the shifts within the social structure itself. Young, fluid, and expanding, the organization of towns and cities has offered apparently unlimited opportunities to the socially ambitious. At the same time that the youngster in the United States was challenged to move to areas of new opportunity, he was taught a value system that placed a high premium on "climbing," "getting ahead" or, less crassly stated, "making the most of himself." Particularly within the last twenty-five years has this kind of mobility drawn the attention of artist and social scientist alike, both of whom have endeavored better to understand and record the dimensions of United States culture.

However, the drama of mobility, geographical and social, has tended to obscure another pattern that is just as deeply entrenched in the nation's value system. The emphasis on change, mobility, and cultural

*This paper was presented at a meeting of the Section on November 24, 1958.

shift in the national scene must always be measured against equally deep feelings for those factors that have operated to give continuity and stability to its development. For every folk saying, for every song, for every story that praises and encourages moving or advancing, there is another that eulogizes home and tradition. These two seemingly inconsistent values form the warp and weft of the national ideal. These two values confront any young citizen of the United States when he plans his future.

From the very first it has been evident that all citizens of the country do not move, either to new areas or "up" or "down" in their own town's social structure. The "solid citizen" and the "old-timer" compete successfully for prestige with their more socially mobile town mates. There exist in every community people who do not move and who seem but little interested or concerned with movement. These might be described, to quote a term used by W. Lloyd Warner (personal communication) as "status complacent." They stand in sharp contrast to their neighbors who appear to have mobility as one of the primary principles for governing their behavior.

Border County provides an excellent laboratory for the examination of this kind of problem. On the periphery of the Allegheny "cradle," it has been a "migratin' county." Examination of its migration patterns by census tracts reveals that one area of Border County provides many more migrants than does the remainder. The fact that the county is geologically divided into two distinct districts implements its analysis. The contrast between the two districts is sufficient to illuminate sharply the factors that may contribute to the differences in mobility apparent here.

From the two districts two representative rural communities have been chosen. One from the eastern section of the county, called Green Valley, has sent but one migrant out of the county since 1900. From the other – Dry Ridge, in the western district – a large proportion of its "surplus" population has moved from the county and out of the state in the same period.

These two communities, with comparable birth rates and with similar excess populations, send approximately the same number of migrants into the county seat, Centerville. The study of Centerville reveals that the experiences of the migrants from the two communities can be sharply contrasted. Not only are the Dry Ridge migrants more likely to migrate farther than those from Green Valley, but they appear to be more status mobile in the area into which they migrate.

In order to gain some measure of movement within Border County an ethnological present covering the period from 1900 to 1950 was utilized. During this period 46 individuals have migrated to the county seat, Centerville, from Dry Ridge, which is located in the hillier section of the county. From Green Valley, in the Bluegrass section of Border

County, 51 individuals migrated to Centerville. As already stated, a greater proportion of Dry Ridge's surplus had moved out of the county and state. The Green Valley surplus to a large extent occupied farms in the Blue Grass district. Exhaustive research described elsewhere (Birdwhistell, 1951) placed the 101 individuals who composed the total migrants from the 2 communities to Centerville in the Centerville social structure. Careful interviewing with older inhabitants, checked against letters and other available documents and records, permitted a measure of movement from the original status position to the 1950 position in Centerville society.

Centerville is a typical Kentucky county seat of 2,422 individuals (as of 1950). Checked by saturation interviews (92 per cent of the families were interviewed), the social status system of Centerville was operationally derived. Six status levels were abstracted with the membership shown in TABLE 1.

TABLE 1

Level	*No.*	*Percentage*
I	7	0.02
II	70	2.89
III	533	21.92
IV	626	25.84
V	816	34.10
VI	334	13.79
Unknown	36	1.44

The migrants from each of the 2 communities were then located in this structure, as shown in TABLE 2.

TABLE 2

Level	*Green Valley*		*Dry Ridge*	
	No.	*Percentage*	*No.*	*Percentage*
I	–	–	–	–
II	–	–	2	4.34
III	7	12.07	9	19.56
IV	47	85.45	12	26.08
V	1	1.81	14	30.43
VI	–	–	9	19.56

It is clear from these charts that the Dry Ridge migrants are distributed proportionately (except for level I) through the Centerville social structure, whereas the Green Valley migrants are disproportionately clumped at level IV. If I am permitted my reconstruction of Dry Ridge and Green

Valley status positions, I can take the original position, measure it against the present position, and gain a movement score.

Social movement in this study is measured as either "up" or "down" from an original position. By taking each level as one step, totaling the steps up or down in the structure for each community, and then dividing by the number of families in each group, I can derive a movement score for the 2 groups. By this calculation Dry Ridge has a movement score of 1, while Green Valley has a score of 0.005. To make this even clearer, only 4 of the 18 Dry Ridge migrant families showed no movement at all, while only 3 of the 19 Green Valley families moved from their original status position.

To summarize: these operations have established the fact that not only is the Dry Ridge community member more likely to move out of the county and state but, if he moves into the small town that is the urban center of Border County, he is much more likely to be vertically mobile than is the migrant from Green Valley. Conversely, to put it with equal validity, the Green Valley community member is less likely to migrate from the county or state and is more stable as far as vertical movement within the Centerville social structure is concerned.

In the original study of Border County I described this differential in mobility potential in the two areas as directly related to the socialization patterns in the two areas. The Dry Ridge socialization pattern emphasizes the breaking of familial ties and stresses individual and independent action; the Green Valley pattern is one that focuses its activity on the establishment of sustaining kith and kin relationships that support and limit the individual.

While working with the Kutenai of Idaho, Montana, and British Columbia, I had been impressed with the differences in acculturation of the two Kutenai groups. The Upper Kutenai, much more individually organized, had far less difficulty in meeting the problems of acculturation presented by the white culture than did the more closely knit group-oriented Lower Kutenai. The Upper Kutenai individual had a far less extended range of interpersonal relationships to consider when he made selections from the larger, more complex value system than did the Lower Kutenai, and this fact seems to have made his adaptation much easier. The differences between the acculturational patterning of the two groups seemed quite consistent with the patterns of interpersonal responsibilities within the respective groups.

In abstracting the Kutenai situation I described the two primary personality types seen there as "segmental" and "interdependent." The segmental personality, described as typical in Upper Kutenai, is characterized by having minimally extended ties with other members of his group. That is, he was primarily responsible only to his parents and children and to his temporary "business partners." Most of his ties are characteristically of an achieved rather than an ascribed nature.

Such a personality makes and breaks interpersonal relationships without too much difficulty. The decisions of such a personality are more generally characterized by pragmatic considerations than as responses to (or in terms of) traditional value systems.

The interdependent personality, on the other hand, is characterized by an extended range of interpersonal ties. These tend to be ascribed rather than achieved in nature. Such a personality sets up continuing interpersonally responsible relationships that can be dissolved only with considerable difficulty. Traditionally maintained value systems are usually held inviolate, even in the face of evident personal disadvantage.

The examination of the accumulating data on Border County social structure indicated that these concepts might have a wider application than simply as a description of the differences between the Upper and the Lower Kutenai. The problems faced by the rural inhabitant of Border County migrating to Centerville or to the industrial cities of the north are probably not qualitatively different from those met by the Kutenai individuals in their association with whites. It seems plausible that there exists a relationship between mobility and segmentality and also between relative immobility and interdependence.

Examination of the Border County data gives every indication of supporting this supposition. This is implicit in the migration and mobility correlations. The Dry Ridge man seems to have been given a far greater maneuverability than that possessed by the Green Valley person. The Dry Ridge man apparently could make the decision to leave the community and go without feeling too strong a responsibility to, or need for, those he left behind him. The fact that relatively few of the Ridge or western district migrants have returned to the county lends support to this supposition. Comparably, the relative immobility of the Green Valley group suggests that not only does this system not operate to force the individual out of the group, but may contain organizational elements that systematically strengthen the ties within the group.

The original research on Border County demonstrated a close correlation between the socialization patterning in the two communities, interdependence and segmentality, and mobility potential. In the discussion to follow, I propose to abstract certain aspects of the dynamics of the family structure in Dry Ridge and Green Valley that are related to these correlations. In so doing, I am not denying the role of all of the other socioeconomic factors that relate to mobility, geographical and social, in Border County, as in other areas. I do not wish to imply that a given family type causes mobility. However, it does seem profitable to see if we can isolate certain structural factors that contribute to or deter mobility.

While Green Valley was settled twenty-five or thirty years before Dry Ridge, the settlers and inhabitants arrived in Kentucky along the

same migration routes from similar areas in the British Isles. A comparable pattern of bilaterality and bilineality prevails in both districts; there is no inheritance patterning other than the strictest division among all offspring. We have only one case in which a son was disinherited: a Dry Ridge father "cut off" a ne'er-do-well son in his will. Community opinion held that this kind of unforgiving attitude was wrong "to take to the grave."

Original land grants ran from 1,000 to 2,000 acres, but large families, plus the inheritance pattern, reduced the inherited farm sizes to less than 200 acres within 2 generations. Except for 1 Green Valley partnership between bachelor brothers in 1890, all farms segment or involve "buyin'-out" activities at the death of the father. There is no distinction made between sons and daughters as inheritors.

In both areas the parent-child relationship is characterized by this pattern of compulsive nonfavoritism. In both areas the baby is the favorite and will remain so until replaced by a younger sibling or until he is eight or nine years old, when it is "just too old to act like a baby any more." The baby is played with by all members of the family, made the center of attention, and caressed by parents and older siblings alike. Careful and repeated observation leads to the conclusion that the infant is encouraged to make demands and to be clinging or tyrannical. However, as soon as the successive baby reaches two or three months of age – that is, becomes a knee-baby – the older child is thrust into the egalitarian system. It is told not to be a baby, criticized, and punished for making demands, and there is a sharp reduction in the show of affection lest it become a spoiled child. Sibling rivalry between children of the same sex is fairly apparent in both areas and, in both, the siblings are urged to work it out themselves. Both boys and girls soon learn that if there is fighting that is reported to the parents, both are likely to be punished, usually by whipping or withdrawal of privilege. The older child is punished for hurting the younger, the younger for aggravating the older. In male-female discord the boy is usually punished for "fighting with girls," while the girl may be admonished for teasing her brothers.

There is some difference between the two areas in brother-sister patterning. The Green Valley girl is encouraged to take over the care of the knee-baby as it is replaced. Her role is more that of a diverter than a surrogate parent whereas, in Dry Ridge, the emphasis on making the replaced baby self-reliant reinforces the dictum not to spoil the infant. In Dry Ridge brothers and sisters are often seemingly quite formal in their relationships as compared to the Green Valley siblings. It is clear that the older sister provides a temporary cushion to the shock of displacement for those youngsters fortunate enough to be in the proper ordinal position in the family. However, many Green Valley youngsters have no older sisters or, as the family continues to expand, they undergo a second displacement situation.

One other distinction between the two areas must be made at this point. The Dry Ridge age-grading system is explicitly a three-stage proposition: infancy, childhood, and maturity. The latter stage is formally marked by marriage or by the fact that the young person begins earning his or her living. Throughout the period of childhood, interdictions in Dry Ridge are prefaced by the statement in which the parent says "As long as you're under my roof..." or "Until you make your own living..." or "Until you are married and have your own family...." This statement of the forthcoming termination of parental responsibility, characteristic of Dry Ridge, is foreign to Green Valley parental instruction. While it is doubtful that a Green Valley parent would actually attempt to maintain control over a married son or daughter to the same degree that obtained in childhood and adolescence, there is no sharp boundary marking the end of parental responsibility. In fact, one of the most interesting phenomena of Green Valley social life is the weekly or biweekly family dinner held by the parent, which the children – married and single – are expected to attend. Only when the children themselves have married children, or when the original parents die, do the children feel free to set up their own Sunday or holiday dinner circle. An uneasy family reunion held annually, or when one of the out-of-state relatives returns for a visit, is the only comparable gathering in Dry Ridge.

To summarize: except for infants, parent-child relations in both Dry Ridge and Green Valley are marked by formality and distance. Affection is certainly present, but is more likely to be shown through a tweaked ear, a pinch, or a thimble rap than a caress or a kiss. The strict moral code preached by the parents, plus the fear of "spoiling the child" or showing favoritism, probably has a good deal to do with this formality.

Sibling rivalry or, rather, sibling tension is present in both areas between siblings who are close to each other in age. For siblings of the same sex where the age differential is as much as ten years or more, the rural task-assignment pattern decreases opportunities for intimacy.

Thus, in both areas, this stern egalitarian pattern leaves the domestic family an area that might be expected to create tension, or at least malaise, in its membership.

If we look beyond this range of kinship reciprocals, the differences between the two areas become more manifest. In Dry Ridge the relationships between uncles and aunts and nephews and nieces are marked by some formality for, while Dry Ridge parental conventions prevent favoritism from being shown among one's own children, it encourages competition among the offspring of siblings. Not only is the Dry Ridge child told to stand on its own feet and urged to be independent, but it is also plied with examples, good and bad, from its father's and mother's siblings' children. Uncles and aunts, less often seen than in Green Valley, may be effusive in their attention to a little nephew or niece. In extended association, however, they are likely to reinforce parental

positions. This is explicitly stated as "Parents must be responsible for their own children: it's bad to interfere."

It would be a mistake to regard the Dry Ridge family as simply a domestic unit surrounded distantly by related domestic units. At every point along the way one's siblings, one's parents, one's uncles and aunts and their children, provide weighted judgments, even if unstated or unheard, about one's behavior. Family approval is sweet, even to a Dry Ridge inhabitant, and rejection is to be feared and avoided. Siblings and parental siblings provide especially powerful voices for measuring one's success and failure. Even for the segmental, independence is more ideal than actual. As Bateson would say, "Stand on your own feet" is an interdict that can never be finally followed.

However, the Dry Ridge pattern is one that encourages movement. Often distant movement removes both critic and rewarder. In Centerville, the Dry Ridge migrant rises or falls easily in the social structure. Not only is he able to move up without taking his relatives with him, but he can fall because there is no built-in support in the system. Not only do his relatives have no obligation to support a downward-mobile kinsman, but they are instructed that to offer unpetitioned aid would be interfering. A Dry Ridge parent will say about a disappointing offspring, "I did what I could—I suppose I should have been more severe when he was young—but now that he's on his own you can't tell another person how to run his life."

Returning to the Green Valley material, we can see sharp contrasts between Dry Ridge and Green Valley in the activities of the extended kindred. Green Valley family gatherings serve as continuing reinforcers of the kinship system. The reader will recall that parental responses are marked by severe responsibility in Green Valley, as in Dry Ridge, but that there is no anticipated terminus in its operation in Green Valley. The relations between parent and child remain relatively formal throughout life. However, one's uncles and aunts in Green Valley seldom act like parental surrogates. In contrast to parents, uncles and aunts may play with, tease, and even encourage nonproductive behavior in the child and adolescent. For example, an uncle will lend a prize horse to a nephew that he would deny his own son or, in the kitchen before dinner, a child will be scolded by the mother for eating between meals or spoiling his appetite, but will be given a cookie or a choice piece of cold ham by an aunt. This same aunt a few minutes later will be severe with her own child only to have her sister or sister-in-law take the child in her arms and comfort it. I have seen as many as ten children in a kitchen at the same time being scolded by their own parents and catered to by their aunts and older female cousins.

One more example of this may make the pattern even clearer. A nephew or a niece may intercede for a cousin in a situation in which the uncle or aunt would refuse permission to do something in the case of his own

child. For instance, two cousins want to go fishing. Each will ask the other's parent to permit his cousin to go with him. If either had asked his own parent, the parent might well have refused on the basis of past bad behavior or because chores were to be finished. Also, all of the siblings might have requested similar rights and, under the equality principle, all or none could be permitted to go. That this is a pattern in some degree of awareness is indicated by the fact that, after the children have left, the adults may remark proudly on how smart the kids are and how they manage to get around their parents.

While sibling tension is present in Green Valley, as in Dry Ridge, the Green Valley youngster generally has a number of cousins within his own age range with whom to play. At the family gatherings at grandfather's, a series of age-graded groups will be seen playing and joking. Here, and at the cooperative work gatherings that characterize the valley, work-pattern associations are formed that will last throughout the individual's life. Younger pairs or groups of cousins cooperate in their evasion of interfering with older siblings, in the cajoling of parents, and in their opposition to nonkindred at school, or on visits to town. It is within these cousin groups that the young valley girl and boy get their first sex instruction and experience. As they grow older, these early associations form the basis for courtship groupings and matchmaking. Finally, as they mature these early associations develop into the labor-lend organization that is so important in the valley economic system.

In other words, while in the immediate family we find many of the same tensions at work in Green Valley as in Dry Ridge between parents and children, and between siblings, these tensions are ameliorated by the cushioning effect of the Green Valley uncle and aunt-nephew and niece reciprocal and by the cousin (immediate and extended) reciprocal. Furthermore, the Valley youngster is not offered freedom from the parents by growing up, nor is his future phrased for him in terms that consider the possibility of his departure from the group. Rather, he can look forward to continued involvement in the kinship structure, which is composed of people from whom he can expect support and to whom he has continuing responsibilities. It is not surprising that the interdependent personality which emerges from this milieu does not migrate easily and seldom shows very much interest in social mobility. The resources brought into action if he gets into trouble serve to keep him from being downward mobile.

The Dry Ridge family structure operates to reduce extensive social ties based on ascribed statuses. It encourages the development of pragmatically justified associations that must be resolved before a new set of associations is possible. It is thus a stimulant to migration and social mobility.

The Green Valley pattern operates to encourage the establishment of sustained relationships without built-in termination points. While the Green Valley pattern is adapted to easy horizontal mobility within the group and makes the addition of group members desirable, if not easy, it discourages any movement that threatens previously established association patterns. Individual migration and social mobility are equally difficult for a member of this group.

Reference

BIRDWHISTELL, R. L. 1951. Border County: A Study in Socialization and Mobility Potential. Doctoral Dissertation (in microfilm). Univ. Chicago Press. Chicago, Ill.

DIVISION OF MYCOLOGY

ASPECTS OF MYCOLOGICAL RESEARCH IN JAPAN*

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Judged in terms of the friendliness and charm of the land and the people, Japan is a giant. Judged in terms of total land mass, however, it is small. Japan is about the same size as Montana and somewhat smaller than California. Montana supports a population of one-half million; California, about ten million. Japan, however, has a population of about 90 million and only about 15 per cent of its total land mass is arable; the rest is forest and mountains. Thus, the basic economy of Japan differs sharply from the economy we know here. Perhaps we can best illustrate this difference by considering agricultural practices. In the United States we are concerned primarily with the yield of a crop measured in terms of yield per man hour. In the United States labor is our costly item. By contrast, in Japan the concern is with the yield per square inch of land. It is the land that is at a premium; labor is more than abundant. In a land with relatively little soil per individual one must also be concerned with maximal nutritional yield per acre. The Japanese cannot afford the luxury of growing corn to feed animals, and so realize only a 25 per cent return of the maximal nutritive value of the corn. This scarcity of land has thus forced the Japanese to seek additional biological space. As their horizontal space is occupied, they have moved into vertical biological space.

In Japan, beautiful experimental work has been carried out by H. Tamiya of the Tokugawa Institute, Tokyo, Japan on the culture of algae for food. Algae can be cultured in a vat, and a vat constitutes vertical biological space. It is perhaps this quest for additional biological space that has led the Japanese to the tremendous use of fermentations, since fermentations also give additional biological space. In the United States land is available on which to grow malt for use as a saccharifying agent. In Japan, however, land is needed for food, so the Japanese carry out saccharification with a fungus, *Aspergillus oryzae*, which need not be cultured on soil; it can be cultured vertically. Moreover, fermentations in many cases, as in soya paste, can improve the quality of food and so save its quantity. Thus fermentations are of great importance to the economy of Japan. In fact, we can judge their importance by the fact that in 1958 the tax paid by the diverse fermentation industries represented 18 per cent of the total income of the state.

*This paper, illustrated with motion pictures, was presented at a meeting of the Division of Mycology on November 25, 1958.

When one speaks of fermentation in Japan, one of course speaks of great diversity. There are those fermentations that give food and drink, such as those involved in the manufacture of soya sauce, soya paste, and sake; these fermentations are peculiarly indigenous to Japan. In addition, however, Japan has a huge fermentation industry that provides such industrial chemicals as alcohol, organic acids, and amino acids. There are also fermentations involving the production of such medicines as the antibiotics.

It might be of interest to consider briefly two indigenous Japanese fermentations. Sake is a national drink and, in Japan, with Japanese food, is a drink of delight. Traditionally, this is made by means of a rice fermentation involving the so-called koji mold, that is, diverse species of *Aspergillus*. In sake manufacture, the saccharifying agent is made from steamed polished rice. This is then inoculated with conidia of a mixed culture of *Aspergillus oryzae*, giving "koji," which serves as the saccharifying agent when steeped in water. Until about fifteen years ago, the process of saccharification was carried out in such a way that a spontaneous lactic acid fermentation was induced, followed by a spontaneous alcohol fermentation. This process was unpredictable and was later revised to make use of commercial lactic acid, also formed by fermentation, and a pure culture of *Saccharomyces sake*. Thus the sake fermentation is carried out by adding steamed rice, koji, and water to the yeast. The fermentation is complete in about 20 days and gives rise to an alcohol content as high as 20 to 22 per cent. The fermentation that I have outlined here is the traditional method. In recent years, however, rice has been sorely needed for food rather than for drink. Japanese scientists, therefore, have studied the chemical composition of the sake flavor and, at present, most of the sake is a blend. Industrial alcohol is manufactured by the fermentation of sweet potatoes, making use of a mixed rizophus and yeast fermentation. The substances found to give sake flavor are then added to such alcohol, and this synthetic sake is then blended with sake formed in the traditional manner. At the present time artificial sake is similar in quality to natural sake and is in general preferred by the Japanese.

Aspergilli are also used in the manufacture of both soya sauce and soya paste, and are used essentially as protein-decomposing agents. The process of koji preparation is about the same in the soya industry as it is in the sake industry although, in this instance, the steamed rice is replaced by steamed wheat and steamed soy beans. A mixture of koji, wheat, sodium chloride, and water is put into a concrete tank and the mash is stored for about one year to complete maturation. During this period, decomposition of protein into amino acids proceeds continuously to the extent of about 70 per cent of the total protein present in the raw materials. A fermentation occupying an entire year, however,

is tedious. To shorten the period and, at the same time, to save additional space for maturation, Japanese scientists have investigated the effect of partial acid hydrolysis. At the present time acid hydrolysis is employed to give about 50 per cent hydrolysis of the total protein. The remaining hydrolysis is then carried out by means of a koji fermentation. Under these conditions mature soya sauce and paste can be prepared in about two months. The *Aspergilli* have occupied an important economic position in Japan for many years, and it is therefore not surprising to find that a great deal of mycological research in Japan is devoted to this group of fungi.

This brings us then to a consideration of the locations where mycological work is done. In this country students interested in agricultural sciences attend agricultural colleges. In Japan the work that is basic to the fermentation industry is in general strongest in the agricultural colleges. Thus it is ultimately from the agricultural colleges that men are drawn into the diverse microbiological studies essential to the fermentation industry, and the view of fermentation as vertical farming is further supported.

In Japan, as in other countries, one of course finds able men engaged in diverse aspects of mycology scattered throughout all of the colleges. Again, as one might reasonably expect, the largest and perhaps the most active groups are those associated with the larger and better financed universities. The Harvard and Yale of Japan are perhaps the Universities of Tokyo and Kyoto; thus we find active groups in the Tokyo and Kyoto areas. Of these one should mention the group of Kin-ichiro Sakaguchi from the College of Agriculture at the University of Tokyo. Sakaguchi and his group have done outstanding work for many years on the problems of the taxonomy and physiology of the *Aspergilli*. Also in Tokyo is Y. Sumiki, whose beautiful work in the 1930s led to the isolation of gibberellin as a mold product. This work was unknown in the United States for many years, but now of course is well known, and has led to very active work on gibberellins. In the Tokyo area there are also groups interested in the isolation of antibiotics. The work of Humao Umezawa and his group at the National Institute of Health in Tokyo led to the discovery of an antibiotic that has recently received great publicity here – kanamycin. Additionally, there are groups in Tokyo, both at the university and at the Kitasato Institute, the Japanese Institute Pasteur, interested in the diverse problems of drug resistance. Mycological research is done also at such institutes as the National Institute of Genetics, Misima, Japan, where very interesting work on the fine structure of fungi has been carried out by the use of thin sections and electron micrography.

In summarizing in a few lines the work of any country, one invariably makes errors of omission, but one cannot properly summarize the work

of Japan without mentioning the groups of J. Ashida at the University of Kyoto and of H. Kikkawa at the University of Osaka.

Japanese industry also contributes to mycological research. In Japan the relationship between industry and the universities appears to be close and cordial. In this connection we might consider briefly some of the research carried out by scientists of the Kyowa Company, Tokyo.

As we all know, many years ago the Japanese found that monosodium glutamate is an excellent enhancer of taste, and the production of monosodium glutamate has developed into a major industry in Japan. In fact, the name Ajinomoto has long been almost synonymous with monosodium glutamate. For many years monosodium glutamate has been produced by the Ajinomoto Company, Tokyo from wheat and soy bean. In the course of the past few years, however, researchers at the Kyowa Company have developed a new and interesting process for the production of monosodium glutamate. Through the use of selection and mutation, these investigators successfully isolated an organism that produces glutamic acid to the extent of as much as 60 per cent of the metabolized sugar when cultured with sweet potatoes as the carbon source. This strain was put to industrial use, and it has been said that production of this process has reached about 200 tons per month, an amount that corresponds to about one fourth of the total Japanese production. It appears likely that this method will ultimately displace the older method involving the isolation of glutamate from wheat and soy beans. The organism employed is a micrococcus, *Micrococcus glutamicus*, and it has been reported that other bacterial species, including *Bacillus megatherium*, are also capable of carrying out this fermentation. Japanese researchers have also reported that it is possible in a similar way to produce additional amino acids, such as ornothine and lysine.

A second problem of industrial interest refers to a process of saccharification in submerged cultures. A strain of *Aspergillus*, *Aspergillus awamori*, was studied in the United States a number of years ago, and it was found that it could be used in submerged cultures for the production of industrial alcohol. This process has not proved of industrial interest in the United States, since the bulk of alcohol there is produced synthetically. In Japan, however, this process has been investigated in detail. It now appears likely that such a species of *Aspergillus* will replace the traditional use of the *Aspergillus oryzae* and that this development will lead to a submerged saccharification process.

In the realm of antibiotics research, the Japanese are beginning to make progress. In the past ten years a number of laboratories in Japan have carried out basic work in the isolation of additional antibiotics and, as we all know, a firm in the United States has recently undertaken the manufacturing of the antibiotic kanamycin. Thus a good deal of industrial research carried out in Japan is directed toward the formulation

of new and improved methods of fermentation and the production of new products.

The industrial advance made in the production of monosodium glutamate in large measure reflects the use by Japanese industry of the young science of microbial genetics. It is only within the last few years that microbial genetics has become a field of major interest in Japan, despite the fact that that country traditionally has had a large number of able geneticists, such as H. Kihara, who not only have contributed basic studies in genetics, but have directed the application of genetics to crop improvement in agriculture. However, Japan now has a number of microbial geneticists and work in this field is increasing rapidly. It might be of interest here to consider certain aspects of the research of these investigators, specifically that aimed at crop improvement in the *Aspergilli*. This work is carried out principally in the Institute of Applied Microbiology, a division of the University of Tokyo. Microbial genetics there is under the direction of Y. Ikeda. Several quite diverse lines of inquiry are under study in that laboratory, but a problem of major interest deals with the study of the two koji molds, *Aspergillus oryzae* and *Aspergillus sojae*. These studies are based on the premise that a basic understanding of the genetics of these organisms could well prove valuable in the industrial exploitation of these fungi. Since these *Aspergilli* are imperfect fungi, it was of interest to see whether they had a parasexual cycle similar to that described by G. Pontecorvo for *Aspergillus nidulans*. Ikeda found that both oryzae and sojae form stable heterocaryons, and that an occasional stable heterozygous diploid strain was also formed from the heterocaryon. The frequency with which diploidization spontaneously occurred was found to be about $1/10^6$. Ikeda, however, made the very interesting observation that if the heterocaryon is exposed to ultraviolet radiation, the frequency of diploidization is enhanced. In fact, the frequency of $1/10^6$ can be increased to $1/10^2$ by using a sufficient dose. It was also observed that these diploids show somatic recombination and, interestingly enough, the frequency of somatic recombination can also be enhanced by the irradiation of the diploid strain. Thus this work has led to very interesting observations concerning the effect of ultraviolet light on both diploidization and somatic recombination. With the discovery of heterocaryons, polyploids, and recombinants, it was then possible to study the effect of such diverse nuclear states on the production of some end product. It was found, for instance, that a heterocaryon formed between an early protease producer and a late protease producer in *A. sojae* showed what might be called heterocaryotic vigor. The heterocaryon produced protease in its early state as well as in its later state and, as a consequence, formed about twice as much protease activity as either of the parental strains. This observation tends to fortify the traditional belief held

by brewmasters that the use of mixed cultures results in higher industrial yield. This heterocaryotic vigor, however, was not observed in all instances. Heterocaryons were studied for kojic acid production and were found to be no better than the parental strains. Thus, clearly, one cannot say that heterocaryon formation is beneficial in all instances. An additional question was also examined, that is, the relative efficiency of the haploid, diploid, triploid, and tetraploid in terms of kojic acid or protease formation. In the case of protease formation, it was found that polyploid strains in general form. larger amounts of protease than haploid strains. In this instance there is apparently a relationship between protease formation and gene dosage but, again, this relationship does not obtain in all cases. The effect of somatic recombination on the production of kojic acid has also been investigated. A heterocaryon formed between a kojic acid producer and a nonproducer gave a diploid after treatment with ultraviolet light. In this instance the diploid was a nonkojic producer. From this diploid, somatic recombinants were isolated, and one improved strain found among the segregants suggested that somatic recombination may be useful in obtaining strains of higher potency in this case. In general, however, no dramatic success has been obtained by use of somatic recombination as a means of obtaining higher producing strains. This lack of success may reflect the fact that somatic recombination, in contrast to meiotic recombination, permits the recombination of relatively small numbers of genes. As the traits that are being measured, such as the ability to produce protease or the ability to produce kojic acid, are undoubtedly controlled by many genes, somatic recombination may not suffice, and methods must still be found that will permit the recombination of larger numbers of genes in imperfect fungi. Such investigations have contributed significantly to our basic understanding of the *Aspergilli,* and I suspect that we shall find in the years ahead that Japan will become an outstanding center of microbial genetic research.

In closing I mention one other aspect of science in Japan. The Japanese universities are state supported, and the support is not generous. The number of individuals in Japan, however, who are interested in careers in teaching or research is high. Hence in Japan we have a nation rich in scientific manpower, but poor in material support. Poor not only in terms of the salaries paid the scientists, but poor in terms of the facilities and equipment provided for their work. One thing that scientists in the United States could do to help their microbiological colleagues in Japan is to obtain financial support for them. Public money used to support research in the United States could also be used profitably in support of research in Japan. Industry in the United States should also support basic research in Japan. Such support will return huge dividends in the years ahead to the people of both countries.

Acknowledgment

I am indebted to Yonosuke Ikeda of the University of Tokyo for information concerning the fermentation industry of Japan and the work being carried out by his group at the Institute of Applied Microbiology.

I also express my appreciation to Francis Ryan and Hiuga Saito for invaluable advice and criticism.

SECTION OF OCEANOGRAPHY AND METEOROLOGY

CLOUD-COVER OBSERVATION AND RADIATIVE MEASUREMENTS FROM A SATELLITE*

Harrison J. Merrill

United States Army Signal Research and Development Laboratory, Fort Monmouth, N. J.

Remarkable progress has been made in the last decade in solving the meteorological problems of understanding the atmosphere and the influence of solar radiation, and of predicting changes in the atmosphere as they affect our climate and environment. Ingenious instrumentation has been developed to make measurements of atmospheric phenomena. The great advance in meteorology was made through the development of radiosondes which, when carried aloft by balloons, measured pressure, temperature, and humidity. Later, when tracking instrumentation was developed, the wind motion as it affected balloons was measured. At best, these techniques, in addition to being troublesome, are slow, and they measure only the particular area through which the balloon is traveling. The sounding of the atmosphere in elevation has been extended by the use of rockets, which have added information concerning the atmospheric constituents and energy balance. However, these flights also have limitations imposed by the complexity of the rocket and the field – limited in both time and extent – in which the atmosphere is measured. The development of satellites promises to add dimension or global quality to the measurement. Meteorological sounding with satellites will graduate from a microscopic to a macroscopic tool.

The development of satellite instrumentation permits the measurement of certain parameters that have never been previously available. In the first place, the satellite is reliable, notwithstanding the difficulties experienced in launching the vehicle. Once the satellite is in orbit, the path becomes known, and we can predict where the vehicle will be and where it is going as a function of time. Naturally, a number of orbit considerations must be developed with the determination of the usefulness of the tool. The present considerations indicate the many advantages of a near-polar orbit at some elevation consistent with the meteorological coverage and the amount of data required, and the resolution of the instrumentation. An influence on the desired orbit will be the developing question as to the desirability of nighttime in contrast to daytime observations.

The perspective from the satellite is an over-all extraterrestrial one looking down into the upper layers of the atmosphere. A primary justifi-

*This paper, illustrated with slides, was presented at a meeting of the Section on November 25, 1958.

cation for the use of the satellite is for meteorological purposes. At the same time, the satellite itself may revolutionize weather forecasting just as the development of upper-atmosphere measurements have revolutionized forecasting in the last decade.

The implication of extending meteorological measurements in a new dimension immediately raises the problem of handling a great mass of data. Obviously, the extension to satellite measurements can be accomplished only through the development of greatly improved machine data, storage, computations, display, and statistical analysis. The data-processing problem is a great challenge to the meteorological forecast because the amount of data will undoubtedly be formidable. The solution of the thermodynamic heat source and heat-sink data becomes complex with the addition of the heat-balance measurements.

An immediate question that arises is: What new significant data can we obtain by the use of satellites to make the effort worthwhile? In what respect can the satellite sounding be used to improve the machinery of meteorological forecast? In order to evaluate this question we must consider the difficult problem of forecasting. It becomes clear that the basic approach must be a global or at least a hemispheric one.[1] This problem is emphasized by the failure of short-term forecasting by the use of the synoptic chart. Even the statistical approach to synoptic charts leaves much to be desired in making a reliable thirty-six-hour forecast. This failure makes it evident that certain fundamental parameters are not considered in the forecast. Instead of using the regional approach, we should recognize that the over-all general circulation is of importance and consider the interaction of polar cells and tropical zones as influenced by local conditions.

The present difficulty in establishing a global forecasting technique includes the problem of obtaining timely, essential data in many areas of the globe or hemisphere; for instance, the coverage in the North Pacific areas and the Arctic region is very sparse and sporadic. In order to evaluate the mechanisms of general motion in these areas, the International Geophysical Year (IGY) has undertaken a program of additional simultaneous observations, including that of the upper atmosphere, to cover these areas.

While we still cannot fill out the pressure, temperature, and humidity charts with satellite data, these data will be immediately useful in giving a detailed observation of the cloud fields. These cloud details in turn may add essential information in the understanding of the global frontal movements. H. Wexler[2] of the United States Weather Bureau has discussed this effect in an article in the *Journal of the British Interplanetary Society,* in which he concludes that appreciable information may be derived from a very superficial knowledge of the cloud cover.

With the development of rocket sounding and an improved knowledge of extraterrestrial radiation, insolation into the atmosphere has assumed

increased significance. The variation of the solar input seems to have an important influence on apparent weather changes. This influence has been postulated for many years, as it affects long-term climatic changes; however, the significant shorter-term variations appear to be increasingly important. At present it appears that the visual insolation is remarkably uniform. However, the variations occur in the particle and short-wave ultraviolet and X-ray radiation. The mechanism of how this energy is absorbed by the atmospheric layers, such as ozone, and how the influence descends into the lower atmosphere can be understood only by more detailed measurements and study. Some influences are very tentative; for example, there is some evidence that motion in the ionosphere is coupled with the atmospheric motions. S. J. Bauer of our laboratory has made a study[3] that shows an apparent statistical correlation between the variations in the ion density with changes in tropospheric conditions.

In the consideration of insolation between the earth and the sun, the absorption and scattering characteristics of water vapor, dust, and water particles, and the constitutents of the gaseous atmosphere are of great importance. We must consider the radiation exchange of the energy received by the earth and the radiation from the earth as modified by local atmospheric disturbances. Especially important are the effect of clouds on this heat balance, the change in latent energy of the gaseous components of the earth, and the stratification that occurs due to temperature fields and ionospheric effects. The great opportunity established by observation from a satellite and its implications for meteorology can be capitalized by measuring this heat balance both in its total effect on the earth and in its local determination of modifying air masses and clouds.

Specific experiments have been proposed to accomplish these two purposes under the sponsorship of the IGY through the National Science Foundation, Washington, D. C. These two experiments are known as (1) the Total Albedo Experiment, proposed by H. Wexler of the United States Weather Bureau and sponsored by V. E. Soumi, University of Wisconsin, Madison, Wis., and (2) the Cloud-Cover Experiment proposed by W. G. Stroud, United States Army Signal Research and Development Laboratory, Fort Monmouth, N. J.[4] and sponsored by W. G. Stroud and his associates, R. Stampfl, and R. Hanel. The first experiment is designed to measure the integrated heat exchange by observing the temperature of four suitable elements mounted on the satellite as it encircles the earth. This experiment makes use of omnidirectional detectors in the form of spheres covered by coatings of various absorptivities and emissivities. The differential heating of the spheres is measured.

The second experiment measures cloud cover in the visible spectrum by a scanning mechanism composed of lead-sulfide cells which, because of the spin of the satellite, sweep out a line path limited in resolution by the optical collector to an angular area of 1.1 degrees. This corresponds to a resolution of about 4 miles on the earth at a 200-mile satel-

lite elevation. This detector, sensitive primarily at 0.6 to 0.8μ wave length in the visible spectrum, is modulated by the optical radiation sweeping through the field of view. As the satellite travels over the earth's surface, successive sweeps in the line scan map the earth. The signal received by the detector will determine a representative signal reflected by the particular surface, such as ground, clouds, or water. Earth areas will have a low reflectivity and will give a minimum signal. However, light scattered from clouds will have a large reflective component and will give a considerable signal. We shall thus be able to map the relation of clouds with respect to land and water masses, and we shall then have a gross determination of the cloud cover in relation to land areas. The cloud cover can then be correlated easily with existing synoptic charts.

The immediate implication as regards meteorological forecasting techniques is that a more extensive situation can be achieved, not only on the synoptic chart, but also in long-range forecasting. The synoptic map, as it is made at the present time, can be made more complete by the addition of the details of the cloud structure. With respect to the identification of air masses, principles of extending visual observations into the existing synoptic charts need be explored. We know that at some point certain meteorological phenomena can be identified by the cloud structure. For instance, at some point the development of a hurricane[5] has its beginning in a tropical disturbance during a particular season of the year. The disturbance has a one-in-ten chance of growing to a hurricane. As the associated trough deepens, it has a one-in-two chance of becoming a hurricane. Finally, that hallmark of the hurricane, "the eye," becomes detectable. It is hoped that the incipient form can be recognized earlier. The accurate portrayal of the cloud extension and form will reveal other information regarding development of fronts and the interreaction of all air masses.

In addition, in the heat balance or radiation detection, a new parameter can be added to the charts. This parameter as charted will reveal the heat exchange by giving a large-area measurement of the balance between insolation and reradiation. This radiation exchange has considerable implication in forecasting because it measures directly a parameter that can be related to the thermodynamic computations. This result in itself advances the possibility of improving particularly medium and long-range forecasts, and is a parameter that can be derived from the first cloud-cover experiment.

The implications for the future are even more exciting. An immediate improvement can be established by making selective measurements in various regions of the electromagnetic spectrum. The selective measurements can be used in several combinations to produce usable information.

The complexity of the atmospheric absorption spectrum is largely a result of water and water-vapor absorption that is not only very strong in

the ultraviolet but also in the infrared at 6.3μ. Second, at both the 4.3- and 15-μ regions we have the carbon dioxide absorption band which is important in the climatic heat exchange of the earth and space. As there is ambiguity with water vapor at 4.3μ, the 15-μ band will be most useful for our purpose. Third, we have the ozone absorption, which is important in the band at 9.6μ. Finally, we have the radiation from the earth, which can be treated as a black body, and measured in the "window" at 11μ. It is possible under these conditions to build radiation experiments that will permit us to derive the atmospheric constituents by looking at the earth in the selective regions of the atmosphere.

An important aspect in probing in depth by using selective absorption and the scattering of sunlight would be the ability to map the cloud cover at 10,000 feet and other elevations as compared simultaneously to the cloud cover and precipitation near the surface of the ground. This information, which can be used in learning more about the motion of fronts, measuring the characteristic slopes of fronts, and predicting their motion, can be achieved by a combination of techniques; that is, the upper clouds may be detected by observing in a window region of the intermediate infrared, which is not absorbed strongly by water vapor. If the band is chosen correctly, the absorption will not be total in the path from the outer atmosphere to 10,000 feet and back again. If there are clouds at 10,000 feet, they will reflect sunlight not totally absorbed by the water vapor, whereas reflections from clouds lower in the atmosphere will be totally absorbed. Precipitation and cloud conditions near the ground, even under the cloud cover, may be detected by the application of radar probe techniques.

In deriving the atmospheric constituents, a very complex scattering by the atmospheric particles of molecules and forms of rain, snow, and ice crystals, and of atmospheric dust, must be considered as modifying the absorption effects. In order adequately to eliminate scattering by clouds, it is necessary to go to radio regions of the spectrum in which the wave length becomes large enough to treat scattering purely by the Rayleigh formula, in which the scattering coefficient is proportional to the inverse fourth power of the wave length. If the Rayleigh boundary condition does not prevail, the scattering function becomes very complex.

Meteorologists have looked at the mass absorption of the atmosphere and have developed certain practical atmospheric attenuation-measuring methods that can be applied to measurements from a satellite. A combination of measurements may be based on Koschmeider's development that contrast is a function of the attenuation and range. This theory has been extended in a complex way to slant visibility in which, by a sort of ray tracing, the meteorological range for various layers can be traced. By using selective radiation that progressively samples the atmospheric constituents, one can now obtain a contrast threshold that must be related to earth targets.

If a proper kind of photo interpretation can be developed, it will be possible to obtain a structure of the atmosphere in a three-dimensional sense. For instance, when there is a clear atmosphere with only a certain amount of ground haze, the contrast of objects on the ground will become better as we move into longer wave lengths because of the improved scattering condition. This improvement becomes complicated as we move into the infrared.

Also, we can determine something of the temperature on the surface of the earth by the use of calibrated infrared detectors, sensitive in the far-infrared region at 11-μ wave length, where neither the absorption due to water vapor nor the scattering of small haze particles is large. By properly calibrating the detector, the temperature of the ground may be charted. These measurements require appreciable sensitivity because of the small variation in temperature that must be detected. By this method we can also chart the surface ocean temperature, which might be of considerable importance in understanding the transport of energy from the middle latitude regions poleward.

Finally, as King[6] points out, there is a unique opportunity to chart the thermal state of the upper atmosphere by analyzing the emission spectrum of the constituents.

In short, then, properly instrumented satellites will permit us to measure significant parameters relating to weather that have never been obtained previously. Specifically, the Total Albedo Experiment will enable us to measure the integrated heat exchange, and the Cloud-Cover Experiment will facilitate a gross determination of the cloud cover in relation to land areas. The net result will be to improve meteorological forecasting. Although much work has already been accomplished, a considerable amount of engineering still remains to be done in order to perfect the instrumentation. In addition, better coordination should be established between engineer and forecaster in order to develop parameters of significance to worldwide weather observations.

References

1. WILLET, H. C. 1951. The forecast problem. Compendium of meteorology. : 731. T. F. Malone, Ed. Am. Meteorol. Soc. Boston, Mass.
2. WEXLER, H. 1954. Observing the weather from a satellite vehicle. J. Brit. Interplanetary Soc. **13**(5): 269.
3. BAUER, S. J. 1958. Correlations between tropospheric and ionospheric parameters. Geofisica Pura e Applicata. Milano. **40**: 235-240.
4. STROUD, W. G. & W. NORDBERG. 1956. Meteorological measurements from a satellite vehicle. Scientific uses of earth satellites. 119. J. A. Van Allen, Ed. Univ. Mich. Press. Ann Arbor, Mich.
5. MALKUS, J. S. 1958. Tropical weather disturbances — why do so few become hurricanes? Weather. **8**(3).
6. KING, J. I. F. 1956. The radiative heat transfer of planet earth. Scientific uses of earth satellites. 133. J. A. Van Allen, Ed. Univ. Mich. Press. Ann Arbor, Mich.

CONFERENCES HELD

SECTION OF BIOLOGY

THE CYTOPATHOLOGY OF VIRUS INFECTION

Friday, November 7 and
Saturday, November 8, 1958

Conference Chairman: Robert Love
Laboratory of Pathology, National Cancer Institute,
National Institutes of Health, Bethesda, Md.

FRIDAY, NOVEMBER 7, 1958

Session Chairman: W. Wilbur Ackermann
Department of Epidemiology, School of Public Health,
Ann Arbor, Mich.

9:00 A.M.–

Greetings from the Academy – Albert S. Gordon, Chairman, Section of Biology, The New York Academy of Sciences, New York, N. Y.; New York University, New York, N. Y.

Introduction – Robert Love, Conference Chairman; Laboratory of Pathology, National Cancer Institute, National Institutes of Health, Bethesda, Md.

"A Comparison of *in vitro* and *in vivo* Characteristics as Related to the Pathogenesis of Measles, Varicella and Herpes Zoster" – William J. Cheatham, Department of Pathology, Vanderbilt University, Nashville, Tenn.

"Double Infection of Cells with Measles and Poliovirus" – Magdalena Reissig, Division of Microbiology, Albert Einstein Medical Center, Philadelphia, Pa.

"Nucleic Acid Metabolism of Virus-Infected HeLa Cells" – Hunein F. Maassab and W. Wilbur Ackermann, Department of Epidemiology, School of Public Health, Ann Arbor, Mich.

"The Relationship of Virus Multiplication to the Development of Morphological and Biochemical Changes in the Cell" – Charles C. Randall, E. B. Bracken, William Todd and Glenn Gentry, Department of Microbiology, The University of Mississippi Medical Center, Jackson, Miss.

"Biochemical Studies of Infection with the Friend Virus" – Hilton Levy and Isadore Brodsky, Laboratory of Infectious Diseases, National Institute of Allergy and Infectious Diseases, National Institutes of Health, Bethesda, Md.

Session Chairman: Henry Pinkerton
Department of Pathology, Saint Louis University
School of Medicine, St. Louis, Mo.

2:00 P.M.–

"Cytopathogenic Effect of Two Newly Recognized Myxovirus Strains – Mechanism of Syncytial Formation" – Pierre Lépine, B. Droz, F. Robbe Fossat and Charles Chany, Service des Virus, Institut Pasteur, Paris, France.

"Quantitative Cytochemical Studies on the Effect of Adenovirus on Cells in Tissue Culture" – Cecilie Leuchtenberger, Georgiana S. Boyer and James Strain, Institute of Pathology, Western Reserve University, Cleveland, Ohio.

"Fluorescent Microscopy of Nucleic Acid Changes in Virus-Infected Cells" – Janet S. F. Niven, National Institute for Medical Research, Mill Hill, London, England.

"Cellular Changes Associated with Infection of the Ehrlich Ascites Tumor with Newcastle Disease Virus" – W. Robert Adams, Laboratory of Pathology, Yale University School of Medicine, New Haven, Conn.

"Cytopathology of Virus-Infected Tumor Cells" – Robert Love, Laboratory of Pathology, National Cancer Institute, National Institutes of Health, Bethesda, Md.

SATURDAY, NOVEMBER 8, 1958

Session Chairman: Pierre Lépine
Service des Virus, Institut Pasteur, Paris, France

9:00 A.M.–

"Cellular Responses to Infection with Strains of Herpes Simplex Virus" – T. F. McNair Scott and D. McLeod, Department of Pediatrics, the Children's Hospital of Philadelphia, University of Pennsylvania, Philadelphia, Pa.

"The Killing of HeLa Cells by Herpes Virus" – Michael G. P. Stoker and Allison Newton, Department of Pathology, Chambers University, Cambridge, England.

"Electron Microscope Studies of Cells Infected with the Salivary Gland Viruses" – Sarah A. Luse and Margaret G. Smith, Department of Pathology, Washington University, St. Louis, Mo.

"Electron Microscope Studies of Molluscum Contagiosum" – William G. Banfield, Laboratory of Pathology, National Cancer Institute, National Institutes of Health, Bethesda, Md.

"Cytopathology of Canine Distemper Studied by the Use of Fluorescent Antibodies" – David L. Coffin, Margaret M. Caspary Institute for Veterinary Research, New York, N. Y.

"Propagation and Cytopathogenicity of Some Arthropod-Borne Viruses in Tissue Culture" – Sonja M. Buckley, The Rockefeller Foundation Virus Laboratories, New York, N. Y.

Session Chairman: Janet S. F. Niven
National Institute for Medical Research, Mill Hill, London, England

2:00 P.M.–

"Biochemical Studies of Virus-Infected Cells" – W. Wilbur Ackermann, Department of Epidemiology, School of Public Health, Ann Arbor, Mich.

"The Relationship of Viral Antigens to Inclusion Bodies" – Ch'ien Liu, Department of Pediatrics, University of Kansas Medical Center, Kansas City, Kan.

"Some Problems of Electron Microscopy in the Study of Virus-Infected Cells" – Carl G. Harford, Alice Hamlin and Esther Parker Rodermund, Department of Internal Medicine, Washington University School of Medicine, St. Louis, Mo.

"The Relationship of Viruses to Inclusion Bodies" – Henry Pinkerton, Department of Pathology, Saint Louis University School of Medicine, St. Louis, Mo.

HYPOTHERMIA

Thursday, November 13 and
Friday, November 14, 1958

Conference Chairman: A. Cecil Taylor
The Rockefeller Institute for Medical Research, New York, N. Y.

THURSDAY, NOVEMBER 13, 1958

GENERAL PHYSIOLOGY OF THE HYPOTHERMIC STATE

Session Chairman: Edward F. Adolph
School of Medicine and Dentistry, University of Rochester,
Rochester, N. Y.

9:00 A.M.–
Greetings from the Academy – Albert S. Gordon, Chairman, Section of Biology, The New York Academy of Sciences, New York, N. Y.; New York University, New York, N. Y.

"Introduction: Zones and Stages of Hypothermia" – Edward F. Adolph, School of Medicine and Dentistry, University of Rochester, Rochester, N. Y.

"The Viability of Supercooled and Frozen Mammals" – Audrey U. Smith, National Institute for Medical Research, Mill Hill, London, England.

"Physiology of Profound Hypothermia by Total Body Perfusion" – Frank Gollan, Veterans Administration Hospital, Nashville, Tenn.

"Lethal Hypothermic Temperature for Dog and Man" – Albert H. Hegnauer, Boston University School of Medicine, Boston, Mass.

"Lethargic Hypothermia in Hibernators and Non-Hibernators" – Vojin Popovic, School of Medicine and Dentistry, University of Rochester, Rochester, N. Y.

"The Effects of Low Temperature on the Biodynamics of Metabolic Processes" – Frank H. Johnson, Princeton University, Princeton, N. J.

EFFECTS OF HYPOTHERMIA ON SPECIFIC FUNCTIONS – CIRCULATORY, RESPIRATORY

Session Chairman: Albert H. Hegnauer
Boston University School of Medicine, Boston, Mass.

2:00 P.M.–

"Functional Processes in the Heart and Possible Effects of Hypothermia" – Chandler McC. Brooks, State University of New York, Downstate Medical Center, Brooklyn, N. Y.

"Excitable Properties of the Hypothermic Heart" – Albert H. Hegnauer and E. T. Angelakos, Boston University School of Medicine, Boston, Mass.

"Influence of Pharmacologic Agents on Spontaneous and Surgically Induced Hypothermic Ventricular Fibrillation" – E. T. Angelakos, Boston University School of Medicine, Boston, Mass.

Discussant: Brian F. Hoffman, State University of New York, Downstate Medical Center, Brooklyn, N. Y.

"Coronary and Systemic Circulation and Hemodynamics" – Robert M. Berne, Western Reserve University, Cleveland, Ohio.

"Acid-Base Balance and Respiration During Hypothermia" – John W. Severinghaus, University of California Medical Center, San Francisco, Calif.

FRIDAY, NOVEMBER 14, 1958

EFFECTS OF HYPOTHERMIA ON SPECIFIC FUNCTIONS – HEPATIC, RENAL, ENDOCRINE, NERVOUS

Session Chairman: Chandler McC. Brooks
State University of New York, Downstate Medical Center, Brooklyn, N. Y.

9:00 A.M.–

"The Effect of Hypothermia on the Liver and Its Functions" – Ralph W. Brauer, Naval Radiological Defense Laboratory, San Francisco, Calif.

"The Effects of Hypothermia on Renal Function and Renal Injury" – John H. Moyer, The Hahnemann Medical College, Philadelphia, Pa.

"Adrenal Cortex and Hypothermic Stress" – David M. Hume, University of Virginia, Charlottesville, Va.

"Hypothermia and the Thyroid Gland" – Philip Bard and James W. Woods, The Johns Hopkins University, School of Medicine, Baltimore, Md.

"Hypothermia and Its Effects on the Sensory and Peripheral Motor Systems" – Paul O. Chatfield, Jefferson Medical College, Philadelphia, Pa.

"Hypothermia and Reaction Patterns of the Nervous System" – Kiyomi Koizumi and Chandler McC. Brooks, State University of New York, Downstate Medical Center, Brooklyn, N. Y.

"Neurologically Induced Physiological Resistance to Hypothermia" – Allan D. Keller, U. S. Army Medical Research Laboratory, Fort Knox, Ky.

"Protective Effects of Hypothermia Against Pathological Processes of the Nervous System" – H. L. Rosomoff, Columbia University, College of Physicians and Surgeons, New York, N. Y.

COOLING AND REWARMING

Session Chairman: Emil Blair
University of Maryland, University Hospital, Baltimore, Md.

2:00 P.M.–

"Heat Transfer from and to Animals in Experimental Hypothermia and Freezing" – J. E. Lovelock and Audrey U. Smith, National Institute for Medical Research, Mill Hill, London, England.

"Thermogenic Factors During Cooling and In the Stabilized Hypothermic State" – T. R. A. Davis, Army Medical Research Laboratory, Fort Knox, Ky.

"Thermal Gradient Alterations During Cooling, In the Stabilized Hypothermic State and on Rewarming" – John W. Severinghaus, University of California Medical Center, San Francisco, Calif.

"Methods for Inducing Hypothermia and Rewarming" – Wilfred G. Bigelow, University of Toronto, Toronto, Canada.

"Anesthesia as a Modifying Factor in the Physiology of Hypothermia" – Robert W, Virtue, University of Colorado School of Medicine, Denver, Colo.

"Biochemical Changes in Human Beings During Refrigeration Anesthesia" – Samuel P. Bessman and R. Adams Cowley, University of Maryland Medical School, Baltimore, Md.

Panel Discussion: "Physiology of Elective Hypothermia in the Human"
Will C. Sealy, Duke University, Durham, N. C.
F. John Lewis, Northwestern University School of Medicine, Evanston, Ill.
Wilfred G. Bigelow, University of Toronto, Toronto, Canada.

Robert W. Virtue, University of Colorado School of Medicine, Denver, Colo.
R. Adams Cowley, University of Maryland Medical School, Baltimore, Md.

SECTION OF PHYSICS AND CHEMISTRY

RADIATION AND HIGH TEMPERATURE BEHAVIOR OF TEXTILES

Friday, November 14 and
Saturday, November 15, 1958

Conference Chairman: J. J. Press
U. S. Navy Clothing and Textile Research Laboratory,
Institute of Polymer Research, Polytechnic Institute of Brooklyn,
Brooklyn, N. Y.

FRIDAY, NOVEMBER 14, 1958

Session Chairman: Hoyt C. Hottel
Professor of Fuel Engineering, Department of Chemical Engineering
Massachusetts Institute of Technology, Cambridge, Mass.

9:00 A.M.–

Greetings from the Academy – Joseph Greenspan, Chairman, Section of Physics and Chemistry, The New York Academy of Sciences, New York, N. Y.; Process and Instruments, Brooklyn, N. Y.

Opening Remarks – J. J. Press, U. S. Navy Clothing and Textile Research Laboratory, Institute of Polymer Research, Polytechnic Institute of Brooklyn, Brooklyn, N. Y.

Introduction to the Conference – Hoyt C. Hottel, Professor of Fuel Engineering, Department of Chemical Engineering, Massachusetts Institute of Technology, Cambridge, Mass.

"Clothing Protection in Modern Warfare" – J. Fred Oesterling, Deputy Scientific Director, Quartermaster Research and Development Command, Natick, Mass.

"Effects of Thermal Radiation on Materials" – Thomas I. Monahan, Joseph M. McGreevy, Willard L. Derksen and John J. Bates, Optics and Nucleonics Branch, Naval Material Laboratory, N. Y. Naval Shipyard, Brooklyn, N. Y.

"Thermal Requirements for Functional Textiles" – Jack Ross, Material Laboratory, Wright-Patterson Air Force Base, Dayton, Ohio.

Session Chairman: J. J. Press
U. S. Clothing and Textile Research Laboratory,
Institute of Polymer Research, Polytechnic Institute of Brooklyn,
Brooklyn, N. Y.

2:00 P.M.–

"Thermal Radiation Burns Beneath Fabric Systems" – George Mixter, Jr., Associate Professor of Surgery, New York University Postgraduate

Medical School, New York, N. Y.; Consultant in Biomedicine, Naval Material Laboratory, Brooklyn, N. Y.

"Human Thermal Tolerance and Protective Clothing" – Paul Webb, Chief, Environment Section, Aero-Medical Laboratory, Wright-Patterson Air Force Base, Dayton, Ohio.

SATURDAY, NOVEMBER 15, 1958

Session Chairman: H. F. Mark
Director, Institute of Polymer Research,
Polytechnic Institute of Brooklyn, Brooklyn, N. Y.

9:00 A.M.–

Introduction to the Session – H. F. Mark, Director, Institute of Polymer Research, Polytechnic Institute of Brooklyn, Brooklyn, N. Y.

"High Temperature Properties of Organic Fibers" – Irvin M. Gottlieb, Textile Research Institute, Princeton, N. J.

"High Temperature Properties of Inorganic Fibers" – R. F. Caroselli, Manager, Textile Process and Product Development Laboratory, Owens-Corning Fiberglas Corporation, Ashton, R. I.

"Textile Reinforcement in High Temperature Plastics" – I. J. Gruntfest, Aerosciences Laboratory, Missile and Ordnance Systems Department, General Electric Company, Philadelphia, Pa.

Session Chairman: J. H. Dillon
Director, Textile Research Institute, Princeton, N. J.

2:00 P.M.–

"Response of Fibers to Intense Thermal Radiation" – Allan J. McQuade and Earl T. Waldron, Textile Functional Finishes Laboratory, Quartermaster Research and Development Command, Natick, Mass.; and Bruce F. Farquhar, Textile Fibers Department, E. I. duPont de Nemours & Company, Wilmington, Del.

"Effects of High Energy Radiation on Polymers" – A. A. Miller, Nucleonics and Radiation, Research Laboratory, General Electric Company, Schenectady, N. Y.

"Modification of Fibers for Improved Thermal Stability" – F. R. Eirich, Professor of Polymer Chemistry, Graduate School, Polytechnic Institute of Brooklyn, Brooklyn, N. Y.

SECTION OF BIOLOGY

AMINE OXIDASE INHIBITORS

Thursday, November 20,
Friday, November 21 and
Saturday, November 22, 1958

Conference Chairman: D. Wayne Woolley
Rockefeller Institute for Medical Research, New York, N. Y.

THURSDAY, NOVEMBER 20, 1958

Session Chairman: Sidney Udenfriend
National Heart Institute, Public Health Service, Bethesda, Md.

9:00 A.M.—
Greetings from the Academy—Albert S. Gordon, Chairman, Section of Biology, The New York Academy of Sciences, New York, N. Y.; New York University, New York, N. Y.

Opening Remarks—D. Wayne Woolley, Rockefeller Institute for Medical Research, New York, N. Y.

"Amino Acid and Fatty Acid Hydrazides—Chemistry and Action on Monoamine Oxidase"—Paul Zeller, Alfred Pletscher, K. G. Gey, H. Gutmann, B. Hegedus and O. Straub, F. Hoffmann-La Roche & Company, Ltd., Basle, Switzerland.

Discussant: John A. Aeschlimann, Hoffmann-La Roche, Inc., Nutley, N. J.

"The Structure and Activity Relationships of Monoamine Oxidase Inhibitors"—John H. Biel, Lakeside Laboratories, Inc., Milwaukee, Wis.

Discussant: Akira Horita, Department of Pharmacology, School of Medicine, University of Washington, Seattle, Wash.

"*In Vitro* and *In Vivo* Inhibition of Amine Oxidases"—E. Albert Zeller, Lorry A. Blanksma, Willy P. Burkard, Winfried L. Pacha and John C. Lazanas, Northwestern University Medical School, Chicago, Ill.

Discussant: Sidney Udenfriend, National Heart Institute, Public Health Service, Bethesda, Md.

"The Pharmacology of JB 516 (PIH)"—Akira Horita, School of Medicine, University of Washington, Seattle, Wash.

Discussant: H. L. Friedman, Lakeside Laboratories, Inc., Milwaukee, Wis.

"Biochemical and Pharmacological Studies of B-Phenylethylhydrazine and Selected Related Compounds"—Max Chessin, Bernard Dubnick,

Gerald Leeson and Charles C. Scott, Warner-Lambert Research Institute, Morris Plains, N. J.

"Interaction of Monoamine Oxidase Inhibitors with Physiological and Biochemical Mechanisms in Brain" – Bernard B. Brodie, Sydney Spector and Parkhurst A. Shore, National Heart Institute, Public Health Service, Bethesda, Md.

Discussant: Harold E. Himwich, Galesburg State Research Hospital, Galesburg, Ill.

"Effects of Amine Oxidase Inhibitors on Cerebral Cortical Responses to Epinephrine" – Bruno Minz and Edward J. Walaszek, Osawatomie State Hospital, Osawatomie, Kans.

Discussant: Julius Axelrod, National Institute of Mental Health, Public Health Service, Bethesda, Md.

"The Pharmacology of Iproniazid and Other Amine Oxidase Inhibitors" – Lowell O. Randall and Robert E. Bagdon, Hoffmann-La Roche, Inc., Nutley, N. J.

Discussant: I. Leusen, University of Ghent, Ghent, Belgium.

Session Chairman: Howard D. Fabing
Christ Hospital, Cincinnati, Ohio

2:00 P.M. –

"Anticonvulsant Properties of Monoamine Oxidase Inhibitors" – Darwin Prockop, Parkhurst A. Shore and Bernard B. Brodie, National Heart Institute, Public Health Service, Bethesda, Md.

Discussant: Joseph P. Buckley, The Schools of the Health Professions, Pittsburgh, Pa.

"Comparison of Marsalid with Other Amine Oxidase Inhibitors with Iproniazid" – Nathan S. Kline, John C. Saunders, Samuel A. Bailey, Ernest Gosline and Maurice Vaisberg, Rockland State Hospital, Orangeburg, N. Y.

Discussant: Alexander P. Dukay, Ypsilanti State Hospital, Ypsilanti, Mich.

"The Inert Psychasthenic Reaction (Anhedonia) as Differentiated from Classic Depression, and Its Response to Iproniazid" – Leo Alexander, Boston State Hospital, Boston, Mass.

Discussant: Theodore R. Robie, Eastern Psychiatric Research Association, East Orange, N. J.

"Therapeutic Experiences with Amine Oxidase Inhibitors in Psychiatry" – Arnold Voelkel, Nervenklinik Waldhaus, Berlin-Nikolassee, Germany.

Discussant: Henry A. Peters, Department of Neuropsychiatry, University of Wisconsin School of Medicine, Madison, Wis.

"Clinical Experience with Newer Antidepressant Drugs and Some Related Encephalographic Observation"—Douglas Goldman, Longview State Hospital, Cincinnati, Ohio.

Discussant: George Ulett, Washington University, St. Louis, Mo.

"The Use of JB 516 (PIH) in Psychiatry"—Henry V. Agin, Beth-El Hospital and Hebrew Home and Hospital for the Aged, Brooklyn, N. Y.

Discussant: Nathan S. Kline, Rockland State Hospital, Orangeburg, N. Y.

"The Treatment of Hospitalized Mental Patients with Iproniazid"—Paul E. Feldman, Topeka State Hospital, Topeka, Kans.

Discussant: John C. Saunders, Rockland State Hospital, Orangeburg, N. Y.

FRIDAY, NOVEMBER 21, 1958

Session Chairman: Nathan S. Kline
Rockland State Hospital, Orangeburg, N. Y.

9:00 A.M.—
"The Influence of Amine Oxidase Inhibitors on Epinephrine Metabolism in Man"—Oscar Resnick, Worcester Foundation, Shrewsbury, Mass.

Discussant: Yutaka Kobayashi, Worcester Foundation, Shrewsbury, Mass.

"Chemical Treatment of Depression"—Frank J. Ayd, Jr., Franklin Square Hospital, Baltimore, Md.

Discussant: Carl Breitner, Arizona State Hospital, Phoenix, Ariz.

"The Use of Iproniazid in Acute Depressive States"—Howard D. Fabing, J. Robert Hawkins, James A. L. Moulton and William E. Hillard, Christ Hospital, Cincinnati, Ohio.

Discussant: Zale A. Yanof, Toledo, Ohio.

"Usefulness of Amine Oxidase Inhibitors in Psychiatry"—Shervert H. Frazier and Robert L. Faucett, Mayo Clinic, Rochester, Minn.

Discussant: Sidney Malitz, New York State Psychiatric Institute, New York, N. Y.

"Clinical Evaluation of Psychostimulants"—Joseph M. Tobin, Marc A. Plante and Lester Kupski, Bureau of Research in Neurology and Psychiatry, Department of Institutions and Agencies, State of New Jersey, Princeton, N. J.

Discussant: Sidney Merlis, Central Islip State Hospital, Central Islip, Long Island, N. Y.

"Relationship of Iproniazid to Epinephrine Metabolism"—Abraham Hoffer, University Hospital, Saskatoon, Saskatchewan, Canada.

"The Phrenopraxic Activity of a Nonnoxious Antidepressant"—Anthony Sainz, Marcy State Hospital, Marcy, N. Y.

Discussants: Gerald J. Sarwer-Foner, E. Koranyi and H. Grauer, Queen Mary Veterans Hospital, Montreal Canada.

"The Place of Iproniazid in Biochemical Psychiatry"—Wilson G. Scanlon, Silver Hill Foundation for the Treatment of Psychoneuroses, New Canaan, Conn.

Discussant: David C. English, Mercywood Neuropsychiatric Hospital, Ann Arbor, Mich.

Session Chairman: Arthur L. Scherbel

Cleveland Clinic and Cleveland Clinic Hospital, Cleveland, Ohio

2:00 P.M.—

"Clinical Uses of Iproniazid"—David Bosworth, St. Luke's and Polyclinic Hospitals, New York, N. Y.

Discussant: B. L. Reynolds, University Hospital, University of Maryland, Baltimore, Md.

"The Effects of Iproniazid and Some Other Amine Oxidase Inhibitors in Rheumatoid Arthritis"—Arthur L. Scherbel and John Harrison, Cleveland Clinic and Cleveland Clinic Hospital, Cleveland, Ohio.

Discussants: Harry E. Banghart, Germantown Hospital, Philadelphia, Pa.; and John Marks, Cambridge University, Cambridge, England.

"Experience with JB 516 (PIH) and Other Psychochemicals in Clinical Practice"—Julius Pomeranze, New York Medical College, New York, N. Y.

Discussants: V. John Kinross-Wright, Baylor University College of Medicine, Houston, Tex.

"The Use of JB 516 (PIH) in Behavior Problems in Children and in Related Neurological Conditions"—Meyer A. Perlstein, Cook County Hospital, Chicago, Ill.

Discussants: Harry Elam and Michel Stein, Cook County Hospital, Chicago, Ill.

"The Effects of Iproniazid and Similar Compounds on the Gastrointestinal Tract (a Clinical Evaluation)"—Jerome Weiss, Samuel Weiss and Bernard Weiss, Polyclinic Hospital, New York, N. Y.

"Metabolism of Iproniazid" – B. Koechlin and V. Iliev, Hoffmann-La Roche, Inc., Nutley, N. J.

"Experimental Pathology of Iproniazid and Related Compounds"–Gerhardt Zbinden and F. Studer, F. Hoffmann-La Roche & Company, Ltd., Basle, Switzerland.

"The Relationship of Certain Vitamin Deficiencies to the Toxicity of Iproniazid"–Fred Rosen, Roswell Park Memorial Institute, Buffalo, N. Y.

Discussant: David B. Coursin, St. Joseph's Hospital, Lancaster, Pa.

"Serial Hepatic Study in Patients with Marsilid"–R. Katz, J. Klinger, L. Silva, Julio Rodriguez and H. Ducci, Hospital San Salvador, Santiago, Chile.

Session Chairman: Jesse Bollman
Mayo Clinic, Rochester, Minn.

8:00 P.M.–
"Some Preliminary Clinical and Biochemical Aspects of Liver Function in Patients Receiving Iproniazid"–Hyman J. Zimmerman, Leigh Rosenblum, Roy J. Korn and Paul Feldman, Chicago Medical School, Chicago, Ill.

"Hepatic Injury in Patients Who Had Received Iproniazid"– Hans Popper, Mount Sinai Hospital, New York, N. Y.

"Changes in Liver Circulation and RES Function Induced by Inhibitors of Amine Oxidase"–Benjamin W. Zweifach, New York University School of Medicine, New York, N. Y.

Discussant: Jesse Bollman, Mayo Clinic, Rochester, Minn.

"Metabolic Studies of Certain Amine Oxidase Inhibitors"–I. J. Greenblatt and A. Kahn, Beth-El Hospital, Brooklyn, N. Y.

Discussant: Louis Gillespie, Jr., National Heart Institute, Public Health Service, Bethesda, Md.

SATURDAY, NOVEMBER 22, 1958

Session Chairman: Dale Friend
Peter Bent Brigham Hospital, Boston, Mass.

9:00 A.M.–
"Serotonin and the Dynamics of the Heart"–Charles W. Crumpton, Cesar A. Castillo, George G. Rowe and George M. Maxwell, University of Wisconsin School of Medicine, Madison, Wis.

"A Method for Measurement of Monoamine Oxidase Inhibition in Man and Its Clinical Application"–Albert Sjoerdsma, Louis Gillespie, Jr.,

and Sidney Udenfriend, National Heart Institute, Public Health Service, Bethesda, Md.

Discussant: Dale Friend, Peter Bent Brigham Hospital, Boston, Mass.

"The Effect of Iproniazid on Survival Following Acute Coronary Occlusion in the Dog"—W. Regelson, F. S. Hoffmeister and H. Rubin, Roswell Park Memorial Institute, Buffalo, N. Y.

"Iproniazid in Angina Pectoris"—Teodoro Cesarman, Instituto Nacional de Cardiologia, Mexico, D.F., Mexico.

"Contribution of Iproniazid in the Treatment of Angina Pectoris; Experience in 300 Cases"—P. Cossio, Cossio Foundation, Buenos Aires, Argentina.

"Isopropylhydrazides in Angina Pectoris"—W. Schweizer, Medizinische Universitätsklinik, Basle, Switzerland.

"Iproniazid Marsalide in Angina Pectoris"—Arthur M. Master and Ephraim Donoso, Mount Sinai Hospital, New York, N. Y.

Discussants: Richard J. Bing, Washington University School of Medicine, St. Louis, Mo.; Joseph E. Riseman, Beth Israel Hospital, Boston, Mass.; and Milton Shoshkes, Beth Israel Hospital, Newark, N. J.

Closing Summary:

"Significance of Monoamine Oxidase Inhibition for the Pharmacological and Clinical Effects of Hydrazine Derivatives"—Alfred Pletscher, F. Hoffmann-La Roche & Company, Ltd., Basle, Switzerland.

NEW MEMBERS

Elected November 20, 1958

LIFE MEMBERSHIP

Berglas, Alexander, M.D., Cancer Research. Active Member, Cancer Research Foundation, Institute Pasteur, Paris, France.

SUSTAINING MEMBERSHIP

Adams, Elijah, M.D., Biochemistry, Pharmacology. Professor, St. Louis University, School of Medicine, St. Louis, Mo.

Alverson, Donald R., M.D., Asthma, Psychiatry. Partner, Bronchial Asthma & Kindred Allergies Clinic, Physicians Clinic, Biloxi, Miss.

Arbonies, William George, M.D., Radiology. Radiologist, St. Mary's Hospital, Reno, Nev.

Gaetano, Charles P., M.D., Obstetrics-Gynecology. Obstetrician-Gynecologist, Private Practice, Hazelcrest, Ill.

Jablons, J. Mitchell, M.A., Pharmaceuticals, Biology. Director, Professional Relations, Jordan, Sieber & Corbett, Inc., New York, N. Y.

Konig, Theodore John, M.D., Hematology, Endocrinology. Staff Physician, Foundation Hospital, Fontana, Calif.

Moszczynski, Boleslaw J., M.D., Cardiology, Rheumatology. Physician, Private Practice, Detroit, Mich.

Wilson, Harry H., M.D., Enzymes, Amino Acids. Consultant, Los Angeles, Calif.

ACTIVE MEMBERSHIP

Abrahams, Irving, M.D., Dermatology. Clinical Instructor, Albert Einstein College of Medicine, New York, N. Y.

Aguilar, Mary Jane Boles, M.D., Pathology, Neuropathology. Resident, Clinical Pathology, Royal Victoria Hospital, Montreal, Canada.

Andrews, J. Robert, M.D., Ionizing Radiations. Chief, Radiation Branch, National Institutes of Health, Bethesda, Md.

Armstrong, John Allan, M.A., Biology, Medicine. Research Associate, Sterling Winthrop Research Institute, Rensselaer, N. Y.

Arndt, William F., Jr., M.A., Microbiology. Graduate Fellow, Rockefeller Institute, New York, N. Y.

Ash, Major M., D.D.S., Pathology, Periodontics. Assistant Professor, University of Michigan, School of Dentistry, Ann Arbor, Mich.

Atkins, Leonard, M.D., Pathology. Assistant, Pathology, Massachusetts General Hospital, Boston, Mass.

Aurousseau, Marcel, Sc.D., Biology. Professor, School of Medicine & Pharmacy, Reims, France.

Ausman, Donald C., M.D., Geriatrics. Physician, Private Practice, Milwaukee, Wis.

Babcock, George, Jr., M.D., Clinical, Pharmacologic Research. Associate Director, Schering Corporation, Bloomfield, N. J.

Badran, Nasri, M.D., Biochemistry. Pharmacology. Pharmaceutical Chemist, Memphis Chemical Company, Zeitolin, Egypt.

Baker, Morton, M.D., Medicine, Radiology. Radiologist, Private Practice, Chicago, Ill.

Bell, Louis X., M.D., Medicine. Physician, Private Practice, Los Angeles, Calif.

Berne, Alfred S., M.D., Diagnostic Roentgenology. Associate Professor, Radiology, State University of New York, Syracuse, N. Y.

Berry, Charles Arthur, B.S., Neuropharmacology. Public Health Fellow, State University of Iowa, College of Medicine, Iowa City, Iowa.

Bertles, John F., M.D., Hematology, Biochemistry. Research Fellow, Harvard Medical School, Boston, Mass.

Binn, Leonard N., Ph.D., Animal Virology. Medical Bacteriologist, Walter Reed Army Institute of Research, Washington, D. C.

Blatteis, Clark Martin, Ph.D., Physiology. 1st Lt., U. S. Army Medical Research Laboratory, Fort Knox, Ky.

Boba, Antonio, M.D., Physiological Trespasses. Assistant Professor, Anesthesiology, Albany Medical College, Albany, N. Y.

Bordt, Dale E., Ph.D., Propogation, Antigenicity of Viruses in Tissue Culture. Senior Technical Staff, Pitman-Moore Company, Zionsville, Ind.

Brandt, Carl D., Ph.D., Virology, Bacteriology. Research Virologist, Chas. Pfizer & Company, Terre Haute, Ind.

Breimer, Charles W., M.D., Radiology. Attending Roentgenologist, Hospital for Special Surgery, New York, N. Y.

Bremner, Robert N., M.D., Medicine. Physician, Private Practice, Cedar Falls, Iowa.

Brosky, Catherine M., B.S., Public Health, Librarian, Graduate School of Public Health, University of Pittsburgh, Pittsburgh, Pa.

Brown, Clinton C., M.D., Psychophysiology, Instrumentation. Director, Psychophysiologic Laboratories, Veterans Administration Hospital, Perry Point, Md.

Brunn, John T., M.D., Medical Hypnosis. Active Staff, St. Alphonsus Hospital, Boise, Idaho.

Buday, Paul V., Ph.D., Pharmacology of Neurohormones. Assistant Professor, Biological Sciences, Fordham University, College of Pharmacy, New York, N. Y.

Burke, Joseph A., S.J., M.A., Experimental Embryology. Instructor, Biology, Loyola College, Baltimore, Md.

Busi, James B., M.D., Medicine. Physician, Private Practice, Sonora, Calif.

Buzaid, Louis L., M.D., Medical-Radiology. Director, Radiology Department, The Queen's Hospital, Honolulu, Hawaii.

Caggiano, John D., M.D., Medicine. Physician, Private Practice, Penns Grove, N. J.

Carlton, Peter Lynn, Ph.D., Experimental Psychology. Research Associate, Squibb Institute for Medical Research, New Brunswick, N. J.

Carvalho, Renato Piza De Souza, M.D., Microbiology, Immunology. Assistant Professor, School of Medicine, Sao Paulo, Brazil.

Chamove, Arnold S., M.D., Atheroselerosis. Chief, Ophthalmology Department, San Francisco Polyclinic & Postgraduate College, San Francisco, Calif.

Chapa-Badillo, Jesús, M.D., Planned Parenthood. Medical Advisor, Local Board #128, Laredo, Texas.

Chu, Ernest H. Y., Ph.D., Genetics, Cytology. Lecturer, Anatomy, Yale University, School of Medicine, New Haven, Conn.

Cohen, Sidney Peck, M.D., Medicine. Physician, Private Practice, Nutley, N. J.

Crawford, Porter F., M.D., Dermatology. Clinical Investigator, The Upjohn Company, Kalamazoo, Mich.

Cray, Cameron, M.D., Psychiatry. Psychiatrist, Private Practice, Palo Alto, Calif.

de Barros, Luiz Gonzaga Tavares, M.D., Cancer. Head, Clinical Medicine Department, Clinica de Cancer, Recife, Brazil.

Dejours, Pierre, M.D., Respiratory, Circulatory Physiology. Professor, Faculte de Medicine, Paris, France.

De Maeyer, Edward, M.D., Virology. Research Fellow, Pediatrics, Harvard Medical School, Boston, Mass.

Dorfman, Milton, M.D., Radiology. Radiologist, Rome Hospital, Rome, N. Y.

Elmer, Richard A., M.D., Medicine, Radiology. Clinical Associate Professor, Emory University, Atlanta, Ga.

Emery, Clyde K., M.D., Cancer Research & Therapy. Director, Emery Cancer Clinic, Los Angeles, Calif.

Fairbridge, Rhodes W., D.Sc., Sedimentology, Geotectonics. Professor, Geology, Columbia University, New York, N. Y.

Farrar, Howard A., M.D., Psychosomatic Medicine, Religion. Physician, Surgeon. Private Practice, Manchester, Tenn.

Farrow, C. Creston, Jr., M.D., Medicine. Resident, Pathology, DePaul Hospital, Norfolk, Va.

Finch, Clement A., M.D., Internal Medicine, Hematology. Professor, University of Washington, School of Medicine, Seattle, Wash.

Fiset, Paul, Ph.D., Virology, Bacteriology. Assistant Professor, University of Rochester, Rochester, N. Y.

Fitch, Lewis William Newlands, B.V.Sc., Veterinary Medicine, Agriculture. Director, Tasman Vaccine Laboratory, Ltd., Upper Hutt, New Zealand.

Flanagan, Earl B., Jr., M.D., Internal Medicine. Physician, Private Practice, Carlsbad, N. Mex.

Fleming, Joe F., M.D., Medicine. Physician, Private Practice, Kingsport, Tenn.

Forbes, Martin, Ph.D., Microbiology. Assistant Professor, Temple University, School of Medicine, Philadelphia, Pa.

Fossaert, Henri C., M.D., Bacteriology, Virology. Chief, Enteric Bacteriology, Ministry of Public Health, Caracas, Venezuela.

Frey, Gunther H., M.D., Industrial, Pharmaceutical Research. Assistant Medical Director, Bristol-Myers Company, New York, N. Y.

Gaitonde, M. K., Ph.D., Neurochemistry. Research Biochemist, McLean Hospital, Waverley, Mass.

Golden, Jacob S., M.D., Medicine, Cardiology. Associate Professor, Northwestern University, School of Medicine, Chicago, Ill.

Gougeon, Jacques, B.A., Chiropractic. Student, Bayside, L. I., N. Y.

Gozun, Benjamin V., M.D., Radiology. Research Associate, New York University, New York, N. Y.

Gressel, Gregory C., M.D., Internal Medicine. Physician, Private Practice, Hamilton, Ohio.

Grillo, Mary A., B.A., Embryology. Ph.D. Candidate, Yale University, School of Medicine, New Haven, Conn.

Grossman, Albert, M.A., Pharmacology. Graduate Student, State University of New York, Brooklyn, N. Y.

Gustafson, Sarah Riedman, Ph.D., Physiology. Director, Medical Literature, Hoffman-La Roche Inc., Nutley, N. J.

Hahn, George A., M.D., Gynecology. Associate Professor, Jefferson Medical College & Hospital, Philadelphia, Pa.

Hannan, John Robert, M.D., Medicine, Radiology. Radiologist, Private Practice, Cleveland, Ohio.

Hauer, Louise R., M.A., Biochemistry, Pharmacology. Literature Scientist, Smith, Kline & French Laboratories, Philadelphia, Pa.

Hauser, Theodore Edwin, M.D., Internal Medicine. Physician, Private Practice, Carlsbad, N. Mex.

Hencken, Frederick Hillens, Ph.D., Pharmacology, Physiology. Senior Scientist, Smith, Kline & French Laboratories, Philadelphia, Pa.

Heuer, Ann E., M.S., Biochemistry, Nucleic Acids. Instructor, Microbiology, Rutgers University, New Brunswick, N. J.

Hines, John H., M.D., Medicine. Physician, Private Practice, Roswell, Ga.

Hoffman, William K., M.D., Obstetrics-Gynecology. Physician, Private Practice, Milwaukee, Wis.

Holland, Gerald F., Ph.D., Chemistry, Biochemistry. Research Chemist, Chas. Pfizer & Company, Brooklyn, N. Y.

Holzman, Philip S., Ph.D., Psychology. Senior Psychologist, Menninger Foundation, Topeka, Kans.

Hopkins, A. L., Ph.D., Muscle Physiology. Instructor, Anatomy, Western Reserve University, Cleveland Ohio.

Hudack, Edward D., M.D., Oncology Research. Assistant Director, Radioisotope Service, Crile Veterans Administration Hospital, Cleveland, Ohio.

Humoller, Fred L., Ph.D., Biochemistry. Principal Scientist, Medical Research Laboratory, Veterans Administration Hospital, Omaha, Nebr.

Hyman, Selman, M.D., Cancer Therapy. Clinical Associate Professor, University of Oregon, School of Medicine, Portland, Oreg.

Inchiosa, Mario A., Jr., Ph.D., Physiology. Senior Research Scientist, Willowbrook State School, Staten Island, N. Y.

Inkles, Seymour, B.A., Biochemistry. President, Kingsbay Pharmaceuticals, Inc., Brooklyn, N. Y.

Ivanoff, John C., M.D., Orthopaedic Surgery. Orthopaedic Surgeon, Riverside County General Hospital, Riverside, Calif.

Jainchill, Jerome L., B.A., Virology, Cancer. Student, New York University, New York, N. Y.

James, Lawrence R., M.D., Radioactive Isotopes. Chief, Radiology Department, Immanuel Hospital, Omaha, Nebr.

Jasmin, Gaétan, M.D., Inflammation, Cancer. Assistant Professor, Experimental Pathology, University of Montreal, Montreal, Canada.

Johnson, Howard W., D.V.M., Animal Diseases. Director, Animal Diseases & Parasite Research Division, U. S. Department of Agriculture, Silver Spring, Md.

Kantaputra, Montri, M.D., Physiology. Assistant Instructor, Siriras School of Medicine, Bangkok, Thailand.

Kasel, Julius Albert, M.S., Microbiology. Bacteriologist, National Institute of Allergy & Infectious Diseases, Bethesda, Md.

Kawalek, Marcel, M.D., Clinical Psychiatry. Psychiatrist, Private Practice, Garden Grove, Calif.

Ketler, Albert, Ph.D., Microbiology, Virology. Member, Research Staff, Children's Hospital, Philadelphia, Pa.

Kien, Gerald Alan, M.S., Pharmacology. Graduate Student, University of Illinois, Chicago, Ill.

Kraines, Samuel Henry, M.D., Clinical Psychiatry. Psychiatrist, Private Practice, Chicago, Ill.

Lang, Irving R., M.D., Placental Physiology. Instructor, Obstetrics-Gynecology, University of Buffalo, School of Medicine, Buffalo, N. Y.

Laskowski, Leonard F., Jr., Ph.D., Microbiology. Assistant Professor, Pathology, St. Louis University, School of Medicine, St. Louis, Mo.

Lawrence, Lewis R., M.D., Radiology, Bone Diseases. Associate Professor, Clinical Radiology, New York University, New York, N. Y.

Lebovitz, Benjamin, M.D., Anesthesiology. Associate, Anesthesia, Midisland Hospital, Bethpage, N. Y.

Lehman, J. Stauffer, M.D., Cardiovascular Radiology. Professor, Radiology Department, The Hahnemann Medical College & Hospital, Philadelphia, Pa.

Lewis, Thomas P., B.S., Medicine. General Manager, Tailby-Mason Company, Inc., New York, N. Y.

Li, Yu-Ying Fu, Ph.D., Radiobiology. Research Associate, State University of Iowa, School of Medicine, Iowa City, Iowa.

Lindner, Anton, M.D., Cancer Biology. Assistant Professor, Clinical Pathology, University of Wisconsin, Madison, Wis.

Littleton, Jesse T., III, M.D., Radiology. Radiologist, Robert Packer Hospital & Guthrie Clinic, Sayre, Pa.

Lofstrom, James E., M.D., Radiology. Chairman-Professor, Radiology Division, Wayne State University, College of Medicine, Detroit, Mich.

Lubin, Martin, M.D., Biophysics, Pharmacology. Assistant Professor, Pharmacology, Harvard Medical School, Boston, Mass.

Macdonald, Roderick, Jr., M.D., Ophthalmology. Assistant Professor, University of Louisville, Medical Center, Louisville, Ky.

Maduros, Bill P., M.D., Leukemia (Viral Etiology). Research Fellow, The Hektoen Institute, Cook County Hospital, Chicago, Ill.

Mantell, Francis J., M.D., Radiology. Radiologist, Veterans Administration Hospital, Excelsior Springs, Mo.

Mark, Lester C., M.D., Anesthesiology. Associate Professor, College of Physicians & Surgeons, Columbia University, New York, N. Y.

Marrs, Theodore C., M.D., Pediatrics. Chief, Pediatrics, Jackson Hospital & Clinic, Montgomery, Ala.

Marston, Judith Hilton, M.S., Medical Microbiology. Assistant, Microbiology Department, Baylor University, College of Medicine, Houston, Texas.

Mason, Rachel Jo Ann, Ph.D., Virology, Immunology. Staff Member, Chas. Pfizer & Company, Terre Haute, Ind.

Mehlman, Myron A., B.S., Biochemical Research. Research Biochemist, Detachment 2, Army Chemical Center, Md.

Meisler, Arnold, M.D., Hematology. Resident, The New York Hospital, New York, N. Y.

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